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ABSTRACT

This competency-based program guide provides course content information and procedures for secondary schools, postsecondary vocational schools, and community colleges in Florida that conduct programs in industrial electricity and commercial and industrial electricity. The first section is on legal authority, which applies to all vocational education programs in Florida. The second section describes the content of the commercial and industrial electricity program, including occupational descriptions, program standards description, competencies, curriculum frameworks and student performance standards for each occupation, instructional approach, course outline and sample lesson plan, and information on student organizations. In the third section, student admission requirements and teacher certification and qualifications are spelled out, while the fourth section provides information on facilities and supplies for the commercial and industrial electricity curriculum. The final section lists instructor resources (both printed and audiovisual materials), and professional organizations and support services. Appendixes to the guide contain a diagram of facilities needed for the program and an organization chart for the student organization, Vocational Industrial Clubs of America. (KC)

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PROGRAM GUIDE
FOR

INDUSTRIAL ELECTRICITY
8727000 (IN47.013902)

AND

COMMERCIAL AND INDUSTRIAL ELECTRICITY
ETI0810 (IN47.019902)

Prepared by

Department of Adult & Vocational Education
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Division of Vocational, Adult, and Community Education

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INTRODUCTION

This Program Guide has been developed to provide information that will be useful to local school district and community college administrators, instructors, program advisory committee members, regional coordinating councils, and others charged with the responsibilty of offering vocational education programs. The final planning and evaluation of any educational program, however, must be done within the context of local conditions. This publication will serve to identify the major concerns that should be considered in the organization, operation, and evaluation of a vocational education program.

The Legal Authority sections of the Guide relate to vocational education programs in general. The remaining sections relate specifically to the vocational education program course for which the Guide is designed.

Vocational education has evolved to meet the needs of students desiring to pursue a selected vocation. In general, vocational education is designed to provide programs, services, and activities that are realistic in light of present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of workers. The new technologies require many additional technical supportive staff to carry out both standardized and specialized procedures.

Today, vocational education is an increasingly viable option for students. The Florida Department of Education shares with business and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. In order to do this, it is necessary both to create exemplary vocational programs and to make those programs consistent throughout the state.

State Board of Education Administrative Rule 6A-10.24: Articulation between universities, community colleges, and school districts outlines steps and guidelines that will bring about a systematic interrelationship between Florida institutions offering similar or related courses and programs. The rule states, in part, that:

> When a student tranfers among postsecondary vocational-technical centers, community colleges, and universities, the receiving institution shall award credit for courses satisfactorily completed at the previous institutions when the courses are judged ... to be equivalent to courses offered at the receiving institution.

This Program Guide helps ensure that equivalency. Throughout Florida, vocational programs, if implemented according to the criteria described in this document, will help many citizens fill an important place in our state and national work force.

LEGAL AUTHORITY

Program Standards

Vocational education programs are established pursuant to Florida Statutes (hereafter F.S.) and enabling Administrative Rules adopted by the Florida State Board of Education (hereafter S.B.E.).

Section 233.0682 F.S.: State Board regulations states:

> The State Board of Education shall adopt regulations setting forth minimum requirements for a comprehensive vocational education program, and shall adopt procedures for determining the extent to which such minimum requirements are being met. Such requirements shall include examination of the employment performance of program participants as well as standards of educational output, with particular emphasis on job placement and satisfactory performance in employment.

This statute is administered by S.B.E. Administrative Rule 6A-6.21: Comprehensive Vocational Education Program; definition, which states, in part, that:

> the term comprehensive vocational education shall include occupational education programs not leading to a bachelor's degree. A comprehensive vocational education program is one which provides vocational programs, services and activities of high quality, realistic in light of actual or anticipated opportunities for gainful employment and suited to the needs, interests, and abilities of the persons to be served.

For the purpose of defining the vocational education programs administered by community colleges within the state, the Division of Community Colleges has adopted S.B.E. 6A-14.34 to implement 240.355 F.S.: State Board of Education Rules, which authorizes "each community college district board of trustees to initiate and provide comprehensive vocational education programs." (NOTE: S.B.E. Rule 6A-14.34 is identical to S.B.E. Rule

6A-6.621 [see above], except that all S.B.E. Chapter 6A-14 rules refer to Division of Community College-sponsored programs, while S.B.E. Chapter 6A-6 rules refer to programs sponsored by the Division of Vocational, Adult, and Community Education.)

S.B.E. Rule 6A-6.571: Criteria for qualification of special vocational-technical education program courses provides for the annual publication of Vocational Education Program Courses Standards. These course standards for each vocational education program are approved by the Florida State Board of Education and published by the Division of Vocational, Adult, and Community Education.

The Program Course Standards provide program descriptions and statements of program objectives that must be adhered to by the school districts in offering vocational programs. The extent to which these Standards are adhered to forms the basis for program review and evaluation.

Special funding provisions for vocational programs are determined in relation to all other education programs under Section 236.081 F.S.: Funds for the operation of schools.

Program Planning

The Vocational Education Planning Process, published in 1980 by the Division of Vocational Education, outlines the procedures local education agencies should follow in developing and submitting their five-year and annual plans for the operation of vocational education programs.

The legal basis for program planning is found in Section 229.55 F.S.: Educational Accountability Act of 1976, and 299.555 F.S.: Educational planning and information systems. These statutes address various aspects of the process of planning effective instructional programs at each level--

from the local school district to the state level. These Florida Statutes are implemented by S.B.E. 6A-6.67: Coordinating Council for vocational education, adult general education, and community instructional services, S.B.E 6A-6.70: Direct job-related vocational offerings required for each school district, and S.B.E. 6A-6.71: Student services.

School districts are encouraged to utilize the resources and support of business, industry, and the community in planning vocational programs. A portion of S.B.E. Rule 6A-6.67, which has particular implications for planning for specific vocational programs in specific schools, follows:

> The responsibilities of the [coordinating] council shall be to review the total vocational education, adult general education, and community instructional services program being offered in the district, to make such recommendations as are necessary, to encourage the development of needed offerings or changes in existing offerings and to avoid unwarranted duplications.

(S.B.E. Rule 6A-14.37 addresses this topic in identical language for community college programs.)

Program Structure

The legal basis for Florida's comprehensive vocational education structure may be found in S.B.E. Rules 6A-6.621 and 6A-14.34: Comprehensive vocational education, definition; 6A-6.63 and 6A-14.343: Scope of vocational education; 6A-6.64 and 6A-14.344: Types of vocational education courses and activities; and 6A-6.65 and 6A-14.345: Instructional components of vocational education.

Perhaps the legal basis for Florida's comprehensive vocational program is stated best in S.B.E. Rules 6A-6.65 and 6A-14.345. These rules define the components of vocational education instruction, beginning with introduction to the world of work in grades 1-6; exploratory experiences in grades 7-9; job-related experiences and prevocational training instruction in grades 10-12; and adult-level training and retraining programs. Special needs of disadvantaged and handicapped individuals at all levels—grade 1 through adults—are considered and provided for. Based upon these rules, Florida has developed a statewide comprehensive vocational program that is recognized as one of the best in the nation.

Program Development

Vocational program development is geared to meet the needs of Florida's employers and students. The vocational planning process incorporates information from business and industry, including data on employers' needs and on emerging trends and changes in technological processes. Legal basis is provided by S.B.E. Rules 6A-6.64 and 6A-14.344, both entitled Types of vocational education courses and activities, for the development of the many vocational courses and programs that must be offered to meet the needs of employers and students. These rules will be amended in the future to bring them more into conformity with 1983 legislation.

Section 228.041 F.S. defines vocational education as follows:

> (22) "Vocational education" is defined as meaning that instruction not leading to a baccalaureate degree, either graded or ungraded, listed below:
>
> (a) Job-preparatory instruction in the minimum competencies necessary for effective entry into an occupation, including diversified cooperative education, work experience, and job entry programs which coordinate directed study and on-the-job training;
>
> (b) Exploratory courses designed to give students initial exposure to the skills and aptitudes associated with a broad range of occupations in order to assist them in making informed decisions regarding their future academic and occupational goals;

(c) Supplemental programs designed to enable persons who are or have been employed in a specific occupation to upgrade their competencies in order to re-enter or maintain stability or advance within their occupation; or

(d) Practical arts courses designed to teach students practical generic skills which, though applicable to some occupations, are not designed to prepare students for entry into specific occupations. Such courses may include, but may not be limited to, typing, industrial arts, and home economics.

Program development is based largely on identifying and meeting the requirements of employers and credentialling agencies. Significant input is sought from advisory groups, ad hoc committees, and task forces made up of representatives from business and industry and instructional, supervisory, and administrative personnel. The Division of Vocational, Adult, and Community Education, the school districts, and community colleges work together to develop programs with objectives that are consistent with employers' requirements.

Educational standards are established for program development. Using these standards as guides and guidelines, effective programs are developed that meet the goals of vocational education, particularly the major goal of preparing students for entry-level employment. These standards are grouped into three categories: input, process, and product. First, standards of input govern requirements for teachers, facilities, and materials. Second, standards of process help determine requirements for instruction, curriculum selection, placement, and evaluation. And third, standards of product are determined by the number and degree of competencies students achieve and by the placement of trained students in jobs.

Program Review and Evaluation

The primary purpose of program review is program improvement. To accomplish this purpose, a review of each vocational program is necessary to determine those areas in which program improvement can be implemented most effectively.

The legal basis for program review is found in Chapter 229.565 F.S. Educational evaluation procedures. Section (3)(e) of that statute requires the Commissioner of Education to periodically examine and evaluate "the standards by which the school district evaluates basic and special programs for quality, efficiency, and effectiveness."

The term "special programs," as used here, includes vocational programs. In turn, under S.B.E. Rule 6A-1.453: Educational program audits, the Commissioner directs the Division to examine and evaluate vocational programs.

S.B.E. Rule 6A-1.453 provides for periodic audits of both the accounts and programs of each school district. It states in part that the Division shall be responsible for examination of vocational education programs to:

a. Determine compliance with law and criteria established by rules of the State Board;

b. Ensure that individual courses use instructional objectives which are consistent with the criteria for qualification of individual courses as outlined in the publications titled, "Vocational Education Program Courses Standards," Rule 6A-6.571, FAC; and

c. Determine that the capability exists in the instructional setting to accomplish the course objectives.

Under this same rule, the Division also is responsible for: "Examination of adult and community education programs to determine compliance with law and criteria established by rules of the State Board" and "determination of the existence and comprehensiveness of the criteria based on district goals, by which the school district evaluates vocational education and adult general education programs."

The Vocational Education Program Courses Standards (and the new Curriculum Frameworks) provide program descriptions and objectives that may be used as criteria against which the program may be reviewed and evaluated. Basically, program review consists of a self-study by the staff of the program to be reviewed, a visitation and review by a Division staff member, a final report outlining areas of strengths and weaknesses, and a plan for strengthening weaknesses and/or improving the program. The data from the program review instruments are treated statistically and incorporated into the evaluation system.

Program Advisory Committees

Program advisory committees are mandated by federal (Public Law 90-576) as well as state regulations. A single State Advisory Council is provided for in S.B.E. Rule 6A-6.75: Advisory Council for Vocational Education. Committees for individual programs are covered under S.B.E. Rule 6A-6.74: Duties and responsibilities, which states that the director of the Division of Vocational, Adult, and Community Education shall "direct the work of the Division to insure the greatest possible coordination, efficiency and effectiveness in vocational and technical education in the state." The Division encourages program advisory committees as a means of fulfilling this mandate.

The Division utilizes a number of advisory committees in addition to those required by law. Each program area—Agribusiness and Natural Resources, Business, Diversified Occupations, Health Occupations, Home Economics, Industrial, Marketing and Distributive, and Public Service

Education—has a corresponding state advisory committee. Also, many general advisory committees have been formed to deal with special programs and problems.

Several advisory committees assist school districts and community colleges with vocational program planning and operation. The legal basis for such use of advisory committees may be found in S.B.E. Rules 6A-6.68 and 6A-14.38, both entitled Business and industrial community support. These rules state that school boards and boards of trustees at all levels should take positive steps (which are enumerated) to establish two-way communications and mutual responsiveness between their institution's vocational education program system and the surrounding business and industrial community.

These rules are responsive to the fact that in program development, implementation, and evaluation it is especially important that advisory committees be effectively utilized at the state and local levels. Community resources are an important part of vocational program development.

DESCRIPTION OF THE OCCUPATION

This Competency Based Program Guide provides course content information and procedures for secondary, postsecondary vocational schools, and community colleges, conducting programs in the occupational area of Industrial Electricity and Commercial & Industrial Electricity.

The Federal Dictionary of Occupational (D.O.T.) Job Titles identifies this occupational area as follows:

D.O.T. JOB TITLE	D.O.T. CODE
Electrician, Industrial	(826.361-010)
Electrician Helper, Industrial	(829.684-022)

The definition (description) for each of these job titles is abstracted from the D.O.T. for easy reference.

Electrician, Industrial (826.361-010)
Installs electrical wiring and assembles components in control cabinets, electrical and industrial equipment, and related industrial apparatus, according to blueprints and wiring diagrams: Squares, alines, and assembles bases, sills, cabinet frames, or equipment structural components, on floor or floor plate, using jacks, clamps, squares, plumb bob and dial indicator. Lays out diagram for electrical installations according to wiring specifications. Drills and taps holes in specified locations for mounting control units, using handtools and drill press. Attaches breakers, relays, contactors, bus bars, transformers, insulators, regulator cabinets,

condenser units, motor and generator sets, meters, plugging devices, and fuse blocks to mounting holes with bolts and screws, using wrenches, screwdrivers, and nut runners. Cuts, strips, bends, and forms wire cable, conduit, pipe, and tubing used to connect circuits and subassemblies, using hacksaw, bandsaw, pipe cutters, and mechanical or hydraulic pipe or cable benders. Connects color coded wires, using mirrors in compact areas. Solders connections and crimps connectors to wire ends, using soldering iron and pliers. Tests and adjusts electrical assemblies, using electrician's handtools and test equipment.

Electrician Helper, Industrial (829.684-022)

Assists Electrician to install and repair electrical wiring, fixtures, and equipment, performing any combination of following tasks: Measures, cuts, and bends wire and conduit, using ruler and handtools. Drills holes for wiring, using power drill, and pulls or pushes wiring through opening. Assists in lifting, positioning, and fastening objects, such as wiring, conduit, and motors. Performs minor repairs, such as replacing fuses, light sockets, bulbs, and switches, using handtools. Maintains tools and equipment and keeps supplies and parts in order. Disassembles defective electrical equipment, such as motors, using handtools.

PROGRAM STANDARDS DESCRIPTION

INTRODUCTION

The Division of Vocational, Adult, and Community Education, Florida State Board of Education, is required by S.B.E. Rule 6A-6.571, to publish VOCATIONAL EDUCATION PROGRAM COURSE STANDARDS annually. The first such standards were published in 1985 and consisted of brief 1-2 page documents called CURRICULUM FRAMEWORKS. These Frameworks contained very brief statements of program objectives and course standards.

Curriculum Frameworks are included in this section of the Program Guide, and contain revised information based on the industry validated competency list. Along with the Curriculum Frameworks are detailed lists of performance objectives called STUDENT PERFORMANCE STANDARDS. The Student Performance Standards are basically performance objective statements for each item on the competency list.

—CAREER MAP COMPETENCY LIST

The Career MAP Competency List was developed by an Industry Advisory Committee and serves as the basis for the Career MAP. This Competency List has been validated by the Industry Representatives and reviewed by Educational Representatives noted in the acknowledgements section of this guide. The list relects the entire range of job tasks performed by employees in industry related jobs. It may include more tasks than is normally taught in a vocational program at any one particular school level and will require that instructors and administrators determine which specialty areas and tasks are appropriate for their program.

—CURRICULUM FRAMEWORKS

The Curriculum Framework specifies the course title and course number, applicable level, major course concepts, and intended outcomes. The intended outcomes section has been correlated with the competency list to include only those performance areas applicable to the course level and purpose.

—STUDENT PERFORMANCE STANDARDS

The Student Performance Standards are abstracted from the Career MAP Competency List, and corresponds to the Curriculum Framework. Student Performance Standards list the detailed performance objectives that support the intended outcomes identified in the Curriculum Frameworks.

—PROGRAM ARTICULATION

Vocational programs that teach the same subject at high schools, vocational technical schools, and community colleges should be structured to eliminate unnecessary retraining of students who have mastered competencies at a lower school level. This coordination of programs at different school levels is referred to as ARTICULATION. Specifically -ARTICULATION- is an arrangement between secondary and vocational-technical centers, and community colleges, which would allow a student who completed a secondary vocational program to enter an area vocational-technical center or community college and receive credit for the secondary vocational program and be placed in the higher level program at an advanced level. It would also allow a student who completed a vocational program in an area vocational-technical center to enter a community college program and receive credit for the area vocational-technical center program and be placed in the higher level program at an advanced level.

ARTICULATION in this manner will require vocational teachers to interview each student entering a postsecondary level program and determine what competencies have been previously mastered. The teacher may have to utilize the Career MAP, if available, or some type of pre-test or performance evaluation to verify that the student is in fact still competent in the appropriate tasks. Teachers of postsecondary programs will often have two or more course tracks operating simultaneously, one for those students with no prior experience, and one or more individualized or small group tracks for students with various levels of prior experience.

—CAREER MAP UTILIZATION

I. Career MAP Definition:

A Career Merit Achievement Plan (Career MAP) is a matrix of vocational competencies that is designed for individual students to record the skills they have mastered in school or industry. The MAPs primarily list performance competencies, although some cognitive competencies are included. Career MAPs contain blocks in which each individual task is listed and includes a line for the instructor to sign, indicating that the student has become competent in the performance of the task. Career Maps are published and distributed separately from the Program Guide.

II. Purpose of Career MAPs:

Career MAPs are being developed for each Industrial Education program in the State of Florida as a means to document student activity and performance and to communicate that activity to employers. The MAPs, showing what a student has already mastered, could also be used by the student when transfering to another school system or a higher level program, to integrate the student into those training programs at the student's level of competence. This is particularly important when entering competency based programs using "open entry-open exit" methodology, or when entering an on-the-job industrial training course. Many companies require employees to periodically attend skill upgrade and crosstraining courses and attend short courses for new equipment and process familiarization. The Career MAP can also be used by employees to record their achievement in industry sponsored training activity, so the MAP becomes an individuals lifetime record of technical competency.

III. Recommended Utilization of Career MAPs:

A. Teachers in Florida Industrial Education and other Vocational related programs should provide every student they teach, a Career MAP to record the student's mastery of each competency completed in the course. Teachers should ensure that the use of Career MAPs are explained to students and should ensure that the students take their Career MAPs with them when they leave the course.

B. Students should use Career MAPs as a record of their technical competence as they progress from high school courses and/or through vocational technical schools, or through community colleges and on into industrial training programs provided by employers. Students pursuing vocational technical careers should use the Career MAP as an overall record of their entire career achievement, maintaining other individual certificates of course completion as supporting documents for Career MAPs.

IV. Career Map Development:

Draft lists of competencies were developed by Industrial Advisory committees under a project administered by the Univerisity of South Florida and funded by the Vocational Division of the State Department of Education. These lists were then reviewed, revised, and validated by craft advisory committees throughout Florida. Committees of teachers as well as industry experts then reviewed the lists. Finally, after Competency Lists were approved by both industry and educational advisors the lists were typeset in a matrix format and printed by the Department of Education. The developers of the MAPs had access to any V-TECS catalogs or Student Performance Standards that were applicable. If objectives were judged relevant they were included but sometimes in different wording. Some competencies listed on the MAP may actually encompass several objectives from other sources or might even be considered as subskills to V-TECS. Career MAPs list competencies that could be learned either in school or after a person has been on the job. Career MAPs, as the words suggest, map the competencies achieved by a person through school training and job experiences.

V. Career MAP's use with Program Guides and Standards:

Course/Program Standards have traditionally been used in the Program Review process and will continue to be used. The Career MAPs do not replace Course/Program Standards. MAPs usually contain competencies beyond those required at the job-entry level. Future editing of Course/Program Standards will more than likely reflect the wording of many of the competencies in the Career MAPs.

Program Guides will be developed for all vocational programs having validated MAPs. The Guide brings together into one document the critical components necessary to initiate or update an existing program. Included in the Program Guide are the MAP competencies, the Program Standards, and guidelines for curriculum development, use of local craft advisory committees, facilities planning, etc.

Career MAPs are intended to facilitate articulation and communication regarding specific vocational programs. The Career MAP is a baseline document for planning and can be used for a variety of purposes: student counseling; curriculum planning; teacher recruitment, and selection; teacher and program updating; facility layout and design; equipment requirement planning; student evaluation; program improvement; and for discussions with craft advisory committees.

Career MAPs can be used to profile the competencies to be mastered for one or more Dictionary of Occupational Titles (DOT) occupations within the major occupational area. Career MAPs reflect state-of-the-art technology for the occupational area and accommodate competency mastery in an industrial setting through cooperative or internship arrangements. Some advanced competencies included on the MAPs are desirable but not necessary for initial employment and may be learned later as supplemental training. Teachers can acquire class sets of the MAPs and use them daily with students from the first day of instruction, or, after keeping separate records of students' mastery of competencies, teachers can transfer these to the MAP just before students exit from the program. Students can request future employers to authenticate additional competencies as they master them on the job.

VI. Obtaining Additional MAPs:

Contact the Industrial Education Regional Consultant or the DVE Regional Office to order MAPs. Entire class sets are available for teacher use. Teachers or users outside the targeted population may purchase sets for a nominal cost-recovery fee. For additional information or training in the use of the Career MAPs contact the Regional Consultant or:

Dissemination and Diffusion Section
Division of Vocational Adult
& Community Education
Department of Education
Knott Building
Tallahassee, FL 32301
(904) 488-0405 or Suncom 278-0405

VALIDATED LIST OF COMPETENCIES
INDUSTRIAL ELECTRICITY
AND
COMMERCIAL AND INDUSTRIAL ELECTRICITY
March 4, 1986

Listed below are competencies that each Industrial Electricity Technician should possess to be a productive beginning worker in these occupations. The numbers to the right of each competency represent the specialization areas indicated below. If a number appears to the right of a competency, that competency is considered essential to the specialization area.

Number	Specialization
1	Electrician, Industrial (826.361-010)
2	Electrician Helper, Industrial (829.684-022)

01.0 LABORATORY PRACTICES

001	Apply laboratory policies & procedures (P)	1	2
002	Apply laboratory safety rules & procedures (P)	1	2

003	Demonstrate the operation of laboratory safety devices (P)	1	2
004	Demonstrate personal safety procedures (P)	1	2
005	Demonstrate first aid/emergency treatment procedures (P)	1	2
006	Apply fire safety rules & procedures (C)	1	2
007	Apply electrical safety rules & procedures (C)	1	2
008	Demonstrate procedures for disaster situations (P)	1	2
009	Solve problems requiring addition, subtraction, multiplication & division of whole numbers (P)	1	2
010	Solve problems requiring addition, subtraction, multiplication & division of common fractions (P)	1	2
011	Solve problems requiring addition, subtraction, multiplication & division of decimal numbers (P)	1	2
012	Convert decimals to fractions & fractions to decimals (P)	1	2
013	Convert English measure to metric measure & metric measure to English measure (P)	1	2
014	Solder & desolder components (P)	1	2
015	Drill holes in metal or plastic chassis (P)	1	2
016	Measure voltage in a simple circuit (P)	1	2
017	Measure amperage in a simple circuit (P)	1	2
018	Measure resistance in a simple circuit (P)	1	2
019	Produce a voltage by chemical means (P)	1	2
020	Produce a voltage by mechanical means (P)	1	2
021	Produce a voltage by thermal means (P)	1	2
022	Produce a voltage by photoelectric means (P)	1	2
023	Identify physical & mechanical abilities of the electrical trade (C)	1	2

024	Demonstrate use & care of ladders (P)	1	2
025	Demonstrate use & care of tools (P)	1	2
026	Demonstrate use of shovels & axes (P)	1	2
027	Prepare a trench for conduit (P)	1	2
028	Backfill and compact a conduit trench (P)	1	2
029	Organize storage areas on site (P)	1	2
030	Demonstrate service truck loading procedures (P)	1	2
031	Perform daily maintenance on service trucks (P)	1	2
032	Demonstrate rigging procedures using ropes, cables, and chains (P)	1	2
033	Identify use of rigging hand signals for crane operators (C)	1	2

02.0 DC CIRCUITS

001	Solve basic algebraic problems as applicable to electricity/electronics (prerequisite to DC) (P)	1	2
002	Relate electricity to nature of matter (C)	1	2
003	Identify sources of electricity (C)	1	2
004	Define voltage, current, resistance, power, & energy (C)	1	2
005	Apply & relate Ohm's Law (P)	1	2
006	Measure properties of a circuit using VOM & DVM meters (P)	1	2
007	Compute & measure conductance & resistance of conductors & insulators (P)	1	2
008	Analyze series circuits (P)	1	2
009	Construct series circuits (P)	1	2

010	Troubleshoot series circuits (P)	1	2
011	Draw a series circuit & calculate circuit values (P)	1	2
012	Analyze parallel circuits (P)	1	2
013	Construct parallel circuits (P)	1	2
014	Troubleshoot parallel circuits (P)	1	2
015	Draw a parallel circuit & calculate circuit values (P)	1	2
016	Analyze series-parallel circuits (P)	1	2
017	Construct series-parallel circuits (P)	1	2
018	Troubleshoot series-parallel circuits (P)	1	2
019	Draw a series-parallel circuit & calculate circuit values (P)	1	2
020	Define magnetic properties of circuits & devices (C)	1	2
021	Determine physical & electrical characteristics of capacitors & inductors (P)	1	2
*022	Analyze & measure RL & RC time constants (P)	1	
023	Set up & operate a VOM for DC circuits (P)	1	2
024	Set up & operate a DVM for DC circuits (P)	1	2
025	Set up & operate power supplies for DC circuits (P)	1	2
*026	Set up & operate oscilloscopes for DC circuits (P)	1	
027	Construct an electromagnet (P)	1	2
028	Construct a simple DC generator (P)	1	2
029	Construct a simple DC motor (P)	1	2
*030	Analyze filter circuits (P)	1	
*031	Construct filter circuits (P)	1	
*032	Troubleshoot filter circuits (P)	1	

*033	Set up & operate frequency counters for DC circuits (P)	1	
*034	Set up & operate signal generators for DC circuits (P)	1	
*035	Set up & operate capacitor-inductor analyzers for DC circuits (P)	1	

03.0 AC CIRCUITS

001	Solve basic trigonometric problems as applicable to electricity/electronics (prerequisite to AC) (P)	1	2
002	Identify properties of an AC signal (C)	1	2
003	Identify AC sources (C)	1	2
*004	Analyze & measure AC signals using oscilloscope, frequency meters, & generators (P)	1	
*005	Analyze AC capacitive circuits (P)	1	
*006	Construct AC capacitive circuits (P)	1	
*007	Troubleshoot AC capacitive circuits (P)	1	
*008	Analyze AC inductive circuits (P)	1	
*009	Construct AC inductive circuits (P)	1	
*010	Troubleshoot AC inductive circuits (P)	1	
011	Analyze & apply principles of transformers to AC circuits (P)	1	2
*012	Analyze RLC circuits (series, parallel, complex) (P)	1	
*013	Construct RLC circuits (series, parallel, complex) (P)	1	
*014	Troubleshoot RLC circuits (series, parallel, complex) (P)	1	
*015	Analyze series & parallel resonant circuits (P)	1	
*016	Construct series & parallel resonant circuits (P)	1	
*017	Troubleshoot series & parallel resonant circuits (P)	1	

018	Analyze polyphase circuits (P)	1	2
019	Construct polyphase circuits (P)	1	2
020	Troubleshoot polyphase circuits (P)	1	2
021	Analyze basic motor theory & operation (P)	1	2
022	Analyze basic generator theory & operation (P)	1	2
023	Set up & operate a VOM for AC circuits (P)	1	2
024	Set up & operate a DVM for AC circuits (P)	1	2
025	Set up & operate power supplies for AC circuits (P)	1	2
*026	Set up & operate impedance bridges for AC circuits (P)	1	
*027	Display & read waveforms (P)	1	
*028	Insert capacitors in series in an AC circuit (P)	1	
*029	Develop a time constant curve (P)	1	
*030	Insert inductors in series in an AC circuit (P)	1	
*031	Construct a series RL circuit (P)	1	
*032	Measure voltage across a resistor & an inductor at varying frequencies in a series RL circuit (P)	1	
*033	Measure voltage across a resistor & an inductor at various values of resistance in a series RL circuit (P)	1	
*034	Measure voltage across a resistor & an inductor at various values of inductance in a series RL circuit (P)	1	
*035	Construct a parallel RL circuit (P)	1	
*036	Measure current through a resistor & an inductor at varying frequencies in a parallel RL circuit (P)	1	
*037	Measure current through a resistor & an inductor at various values of resistance in a parallel RL circuit (P)	1	

*038	Measure current through a resistor & an inductor at various values of inductance in a parallel RL circuit (P)	1
*039	Construct a series RC circuit (P)	1
*040	Measure voltage across a resistor & a capacitor at varying frequencies in a series RC circuit (P)	1
*041	Measure voltage across a resistor & a capacitor at various values of resistance in a series RC circuit (P)	1
*042	Measure voltage across a resistor & a capacitor at various values of capacitance in a series RC circuit (P)	1
*043	Construct a parallel RC circuit (P)	1
*044	Measure current through a resistor & a capacitor at varying frequencies in a parallel RC circuit (P)	1
*045	Measure current through a resistor & a capacitor at various values of resistance in a parallel RC circuit (P)	1
*046	Measure current through a resistor & a capacitor at various values of capacitance in a parallel RC circuit (P)	1
*047	Construct a series RLC circuit (P)	1
*048	Measure voltage across a resistor, a capacitor, & an inductor at varying frequencies in a series RLC circuit (P)	1
*049	Measure voltage across a resistor, a capacitor, & an inductor at various values of resistance in a series RLC circuit (P)	1
*050	Measure voltage across a resistor, a capacitor, & an inductor at various values of capacitance in a series RLC circuit (P)	1
*051	Measure voltage across a resistor, a capacitor, & an inductor at various values of inductance in a series RLC circuit (P)	1
*052	Construct a parallel RLC circuit (P)	1

*053	Measure current through a resistor, a capacitor, & an inductor at varying frequencies in a parallel RLC circuit (P)	1
*054	Measure current through a resistor, a capacitor, & an inductor at various values of resistance in a parallel RLC circuit (P)	1
*055	Measure current through a resistor, a capacitor, & an inductor at various values of capacitance in a parallel RLC circuit (P)	1
*056	Measure current through a resistor, a capacitor, & an inductor at various values of inductance in a parallel RLC circuit (P)	1
*057	Read & interpret color codes to identify resistors (P)	1
*058	Analyze voltage dividers (loaded & unloaded) (P)	1
*059	Construct voltage dividers (loaded & unloaded) (P)	1
*060	Troubleshoot voltage dividers (loaded & unloaded) (P)	1
*061	Solve network theorem problems using Kirchhoff, (V & I), Thevenin, Norton, Superposition, & Delta-wye (P)	1
*062	Analyze maximum power transfer theory (P)	1
*063	Construct maximum power transfer theory (P)	1
*064	Troubleshoot maximum power transfer theory (P)	1

04.0 ELECTRONIC COMPONENTS & CIRCUITS

*001	Test semiconductor diodes (P)	1
*002	Test thyristors (P)	1
*003	Test bipolar transistors (P)	1
*004	Test unijunction transistors (P)	1
*005	Test circuit protection devices (P)	1
*006	Construct a half-wave low-voltage power supply circuit (P)	1

*007	Construct a full-wave low-voltage power supply circuit (P)	1
*008	Construct a full-wave low-voltage regulated power supply circuit (P)	1
*009	Construct a full-wave bridge-rectifier power supply circuit (P)	1
*010	Construct a UJT relaxation oscillator circuit (P)	1

05.0 BASIC LOGIC CIRCUITS

*001	Convert decimal numbers to binary numbers (P)	1
*002	Convert decimal numbers to octal numbers (P)	1
*003	Solve problems using Boolean algebra (P)	1
*004	Construct an AND gate circuit (P)	1
*005	Construct an OR gate circuit (P)	1
*006	Construct an inverter circuit (P)	1
*007	Construct a NAND gate circuit (P)	1
*008	Construct a NOR gate circuit (P)	1
*009	Construct an exclusive OR gate circuit (P)	1
*010	Construct an RS & steered flip-flop (P)	1
*011	Construct a J-K flip-flop (P)	1
*012	Construct a logic counter circuit (P)	1
*013	Construct a logic addition & subtraction circuit (P)	1
*014	Construct a logic multiplication & division circuit (P)	1
*015	Construct a logic memory circuit (P)	1

06.0 INDUSTRIAL WIRING

001	Obtain electrical wiring installation requirements from an industrial electrical plan/drawing (P)	1	2
002	Draw an industrial electrical floor plan (P)	1	2
003	Charge a lead-acid battery (P)	1	2
004	Charge a nickle-cadmium battery (P)	1	2
005	Repair an emergency lighting system (P)	1	2
*006	Correct the power factor on a system (P)	1	
*007	Install a bus duct (P)	1	
*008	Install bundled wiring in mounted lay-in duct work (P)	1	
009	Install circuit breakers in a panel board (P)	1	2
010	Install a circuit using non-metallic sheathed cable (P)	1	2
011	Install & connect system grounds (P)	1	2
012	Install a distribution panel board (P)	1	2
013	Install electrical metallic tubing (P)	1	2
014	Install explosion-proof equipment (P)	1	2
015	Install power & controls for A/C systems (P)	1	2
016	Install a fluorescent lighting fixture (P)	1	2
017	Install an incandescent lighting fixture (P)	1	2
018	Install a lighting dimmer system (P)	1	2
019	Install liquid-tight flexible metal conduit (P)	1	2
020	Install multi-conductor cable (P)	1	2
021	Install a multi-conduit layout (P)	1	2
022	Install a multi-control lighting circuit (P)	1	2
023	Install non-liquid-tight flexible metal conduit (P)	1	2

024	Install plastic conduit (P)	1	2
*025	Install plug-in duct work (P)	1	
*026	Install a power-feeder wiring system to machinery (P)	1	
*027	Install a public address system (P)	1	
*028	Install analog systems (P)	1	
*029	Install digital communications cabling (P)	1	
*030	Install fiber-optics communications cabling (P)	1	
031	Install rigid conduit (P)	1	2
032	Install the service-entrance head for a service drop (P)	1	2
033	Install underfloor duct work (P)	1	2
034	Install an underground service entrance (P)	1	2
*035	Install & terminate high-voltage cable (P)	1	
*036	Operate high-voltage test equipment (P)	1	
*037	Use a megger (test kit) to test insulation (P)	1	
038	Prepare an equipment & material list (P)	1	2
039	Complete an equipment & material order (P)	1	2
040	Receive an equipment & material order (P)	1	2
041	Install thin wall (EMT) conduit (P)	1	2
042	Install a single phase receptacle circuit (P)	1	2
043	Install a three phase receptable circuit (P)	1	2
044	Comply with basic National Electrical Code requirements (C)	1	2

07.0 TRANSFORMER INSTALLATION

001	Connect a single-phase step-down transformer (P)	1	2

002	Connect a single-phase step-up transformer (P)	1	2
003	Connect two single-phase transformers in parallel (P)	1	2
004	Connect two single-phase transformers in an open-delta configuration (P)	1	2
005	Connect a dual-voltage transformer (for high-voltage input & output) (P)	1	2
006	Connect a dual-voltage transformer (for low-voltage input & output) (P)	1	2
007	Connect an auto-transformer to give a variety of output voltages (P)	1	2
008	Connect a single-phase distribution transformer to supply 1 215 & 230 volts (P)	1	2
009	Connect a three-phase power transformer for a three-phase, four-wire connection (P)	1	2
010	Connect a three-phase transformer for a three-phase, delta configuration (P)	1	2
011	Connect a three-phase power transformer for a three-phase, wye configuration (P)	1	2
012	Connect three single-phase transformers to form a delta-delta configuration (P)	1	2
013	Connect three single-phase transformers to form a delta-star configuration (P)	1	2
014	Connect three single-phase transformers to form a star-delta three-phase configuration (P)	1	2
015	Connect three single-phase transformers to form a star-star three-phase configuration (P)	1	2

016	Install a current transformer & measure current flow (P)	1	2
017	Install a potential transformer & measure voltage (P)	1	2
018	Connect a booster transformer (P)	1	2
019	Connect a bucking transformer (P)	1	2

08.0 AC & DC ROTATING EQUIPMENT

001	Connect a DC shunt motor (P)	1	2
002	Connect a DC series motor (P)	1	2
003	Connect a DC compound motor (P)	1	2
004	Connect a DC separately-excited shunt generator (P)	1	2
005	Connect a DC self-excited shunt generator (P)	1	2
006	Connect a DC compound generator (P)	1	2
007	Connect a DC series generator (P)	1	2
008	Connect a capacitor-start motor (P)	1	2
009	Connect a split-phase induction motor (P)	1	2
010	Connect a capacitor-run motor (P)	1	2
011	Connect a universal motor (P)	1	2
012	Connect a repulsion-start, induction-run motor (P)	1	2
013	Connect a three-phase wound-rotor induction motor (P)	1	2
014	Connect a three-phase squirrel-cage induction motor (P)	1	2
015	Connect a three-phase synchronous motor (P)	1	2
016	Connect a three-phase alternator (P)	1	2

09.0 ELECTRICAL CONTROLS & DEVICES

001	Draw an elementary motor-control line diagram (P)	1	2
002	Install a manual motor-control station (P)	1	2
003	Install an automatic, push-button motor-control station (P)	1	2
004	Install a three-phase-control magnetic starter (P)	1	2
005	Install a two-station, push-button control station (P)	1	2
006	Install a drum-switch control station (P)	1	2
007	Install a control circuit to change the direction of rotation of a motor (P)	1	2
008	Install a hands-off, automatic control circuit (P)	1	2
009	Install a multiple push-button station (P)	1	2
010	Install an interlocking/reversing control circuit (P)	1	2
011	Install a hand-sequence control circuit (P)	1	2
*012	Install a timed-sequence control circuit (P)	1	
*013	Install an automatic-sequence control circuit (P)	1	
014	Install an AC reduced-voltage starter (resistance) (P)	1	2
015	Install a part-winding starter (P)	1	2
016	Install a three-phase multispeed controller (P)	1	2
017	Install a direct-current motor controller (P)	1	2
*018	Connect a pilot-motor-driven motor-timing control (P)	1	
*019	Connect a capacitor timing starter (P)	1	
*020	Install a jogging control circuit (P)	1	
*021	Install a plugging control circuit (P)	1	
*022	Install an electric breaking device (P)	1	
*023	Install a direct-drive station (P)	1	

*024	Install a gear-motor station (P)	1	
*025	Construct a linear voltage regulator (P)	1	
*026	Construct a switching voltage regulator (P)	1	
*027	Construct an electronic wiring circuit (P)	1	
*028	Construct a photoelectric relay circuit (P)	1	
*029	Construct an operational amplifier circuit (P)	1	
*030	Construct a transistor speed-control circuit (P)	1	
*031	Construct a closed-loop speed-control circuit (P)	1	
*032	Construct a pulse-width speed-control circuit (P)	1	
*033	Construct a Triac speed-control circuit (P)	1	
*034	Operate digital control systems for computer control systems (P)	1	
*035	Install solid-state motor control systems (P)	1	
*036	Install digital control systems (computer systems) (P)	1	
*037	Construct a basic SCR speed-control circuit (P)	1	
*038	Construct a pulse-triggered SCR speed-control circuit (P)	1	
*039	Construct a closed-loop SCR speed-control circuit (P)	1	
*040	Construct a tachometer-feedback speed-control circuit (P)	1	

10.0 MOTOR REPAIR

001	Disassemble & assemble a DC motor (P)	1	2
002	Disassemble & assemble a single-phase motor (P)	1	2
003	Disassemble & assemble a three-phase motor (P)	1	2
*004	Prepare a motor data card (P)	1	

*005	Wind a DC motor (P)	1	
*006	Wind a single-phase motor (P)	1	
*007	Wind a three-phase motor (P)	1	
008	Install & connect a motor starting switch (P)	1	2
009	Install a motor centrifugal mechanism (P)	1	2
010	Install motor bearings & bushings (P)	1	2
011	Troubleshoot & repair a DC motor (P)	1	2
012	Troubleshoot & repair a single-phase motor (P)	1	2
013	Troubleshoot & repair a three-phase motor (P)	1	2

11.0 EMPLOYABILITY SKILLS

001	List sources of job openings other than public or private employment agencies (P)	1	2
002	Write a letter of application for a job (P)	1	2
003	Prepare a resume or personal fact sheet (P)	1	2
004	List factors to consider when applying for a job (P)	1	2
005	List ways of making contact with employers (P)	1	2
006	Identify documents which may be required when applying for a job interview (C)	1	2
007	Complete a job application form correctly (P)	1	2
008	Identify appropriate dress & grooming for a job interview (C)	1	2

009	Classify behaviors considered to be appropriate in a job interview situation (C)	1	2
010	Describe the advantages to the employer & employee of being a productive worker (C)	1	2
011	Explain the purpose of supervision, self-discipline, & performance evaluation (C)	1	2
012	Identify appropriate response(s) to criticism from employer, supervisor, or other employees (C)	1	2
013	List consequences of frequently being absent from the job (P)	1	2
014	List consequences of frequently arriving late for work (P)	1	2
015	List factors to consider when resigning from a job (P)	1	2
016	Write a letter of resignation (P)	1	2
017	Interact with customers (P)	1	2
018	Locate local & regional job opportunities (P)	1	2

KEY

(C) Cognitive

(P) Performance

* These competencies apply to post secondary Commercial & Industrial Electrician Programs. Those competencies that are related to electronics technicians are optional for the Commerical & Industrial Electrician Program.

DRAFT RECOMMENDATIONS AS OF 1/1/86

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Industrial Electricity

CODE NUMBER: Secondary 8727000 Postsecondary ______

Florida CIP IN47.013902

SECONDARY SCHOOL CREDITS ______ COLLEGE CREDITS ______ POSTSECONDARY ADULT VOCATIONAL CREDITS ______

APPLICABLE LEVELS(S): __7-9 __9-12 __Postsecondary Adult Vocational

__Postsecondary Vocational X Other 10-12, 21

CERTIFICATION COVERAGE: ELECTRICAL 7 TEC ELEC @ 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as electricians, industrial (826.361-010) and electrician helpers, industrial (829.684-022), or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and assembly, installation, operation, maintenance, and repair of electrical/electronic equipment used in industry and manufacturing.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in residential, commercial, and industrial wiring; servicing, maintaining, and using equipment, including lighting, conduit (raceway) systems, motors, and related equipment following the National Electrical Code, as well as hydraulic, pneumatic, and electronic controls and alarm systems.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing communicatons, leadership, human relations, and employability training experiences and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal.

In accordance with Section 240.149 F.S., the minimum basic skills grade level required for this postsecondary adult vocational program is: Mathematics 7.0, Language 7.0. This grade level number corresponds to a grade equivalent score obtained on a state designated basic skills examination.

The typical length of this program for the average achieving student is 1800 contact hours (2160 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the individual will be able to:

01. Demonstrate proficiency in laboratory practices
02. Demonstrate proficiency in DC circuits
03. Demonstrate proficiency in AC circuits
04. Demonstrate industrial wiring skills
05. Install transformers
06. Operate AC and DC rotating equipment
07. Construct control circuits and install electrical controls and devices.
08. Repair motors
09. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS

INDUSTRIAL ELECTRICITY

01.0 DEMONSTRATE PROFICIENCY IN LABORATORY PRACTICES—The student will be able to:

01.001 Apply laboratory policies and procedures
01.002 Apply laboratory safety rules and procedures
01.003 Demonstrate the operation of laboratory safety devices
01.004 Demonstrate personal safety procedures
01.005 Demonstrate first aid/emergency treatment procedures
01.006 Apply fire safety rules and procedures
01.007 Apply electrical safety rules and procedures
01.008 Demonstrate procedures for disaster situations
01.009 Solve problems requiring addition, subtraction, multiplication and division of whole numbers
01.010 Solve problems requiring addition, subtraction, multiplication and division of common fractions
01.011 Solve problems requiring addition, subtraction, multiplication and division of decimal numbers
01.012 Convert decimals to fractions and fractions to decimals
01.013 Convert English measure to metric measure and metric measure to English measure
01.014 Solder and desolder components

01.015 Drill holes in metal or plastic chassis

01.016 Measure voltage in a simple circuit

01.017 Measure amperage in a simple circuit

01.018 Measure resistance in a simple circuit

01.019 Produce a voltage by chemical means

01.020 Produce a voltage by mechanical means

01.021 Produce a voltage by thermal means

01.022 Produce a voltage by photoelectric means

01.023 Identify physical and mechanical abilities of the electrical trade

01.024 Demonstrate use & care of ladders

01.025 Demonstrate use & care of tools

01.026 Demonstrate use of shovels & axes

01.027 Prepare a trench for conduit

01.028 Backfill and compact a conduit trench

01.029 Organize storage areas on site

01.030 Demonstrate service truck loading procedures

01.031 Perform daily maintenance on servie trucks

01.032 Demonstrate rigging procedures using ropes, cables, and chains

01.033 Identify use of rigging hand signals for crane operators

02.0 DEMONSTRATE PROFICIENCY IN DC CIRCUITS--The student will be able to:

02.001 Solve basic algebraic problems as applicable to electricity/electronics (prerequisite to DC)
02.002 Relate electricity to the nature of matter
02.003 Identify sources of electricity
02.004 Define voltage, current, resistance, power, and energy
02.005 Apply and relate Ohm's Law
02.006 Measure properties of a circuit using VOM and DVM meters
02.007 Compute and measure conductance and resistance of conductors and insulators
02.008 Analyze series circuits
02.009 Construct series circuits
02.010 Troubleshoot series circuits
02.011 Draw a series circuit and calculate circuit values
02.012 Analyze parallel circuits
02.013 Construct parallel circuits
02.014 Troubleshoot parallel circuits
02.015 Draw a parallel circuit and calculate circuit values
02.016 Analyze series-parallel circuits
02.017 Construct series-parallel circuits
02.018 Troubleshoot series-parallel circuits
02.019 Draw a series-parallel circuit and calculate circuit values
02.020 Define magnetic properties of circuits and devices

02.021 Determine physical and electrical characteristics of capacitors and inductors

02.022 Set up and operate a VOM for DC circuits

02.023 Set up and operate a DVM for DC circuits

02.024 Set up and operate power supplies for DC circuits

02.025 Construct an electromagnet

02.026 Construct a simple DC generator

02.027 Construct a simple DC motor

03.0 DEMONSTRATE PROFICIENCY IN AC CIRCUITS--The student will be able to:

03.001 Solve basic trigonometric problems as applicable to electricity/electronics (prerequisite to AC)

03.002 Identify properties of an AC signal

03.003 Identify AC sources

03.004 Analyze and apply principles of transformers to AC circuits

03.005 Analyze polyphase circuits

03.006 Construct polyphase circuits

03.007 Troubleshoot polyphase circuits

03.008 Analyze basic motor theory and operation

03.009 Analyze basic generator theory and operation

03.010 Set up and operate a VOM for AC circuits

03.011 Set up and operate a DVM for AC circuits

03.012 Set up and operate power supplies for AC circuits

04.0 DEMONSTRATE INDUSTRIAL WIRING SKILLS--The student will be able to:

04.001 Obtain electrical wiring installation requirements from an industrial electrical plan/drawing

04.002 Draw an industrial electrical floor plan

04.003 Charge a lead-acid battery

04.004 Charge a nickle-cadmium battery

04.005 Repair an emergency lighting system

04.006 Install circuit breakers in a panel board

04.007 Install a circuit using non-metallic sheathed cable

04.008 Install and connect system grounds

04.009 Install a distribution panel board

04.010 Install electrical metallic tubing

04.011 Install explosion-proof equipment

04.012 Install power and controls for A/C systems

04.013 Install a fluorescent lighting fixture

04.014 Install an incandescent lighting fixture

04.015 Install a lighting dimmer system

04.016 Install liquid-tight flexible metal conduit

04.017 Install multi-conductor cable

04.018 Install a multi-conduit layout

04.019 Install a multi-control lighting circuit

04.020 Install non-liquid-tight flexible metal conduit

04.021 Install plastic conduit

04.022 Install rigid conduit

04.023 Install the service-entrance head for a service drop

04.024 Install underfloor duct work

04.025 Install an underground service entrance

04.026 Prepare an equipment and material list

04.027 Complete an equipment and material order

04.028 Receive an equipment and material order

04.029 Install thin wall (EMT) conduit

04.030 Install a single phase receptacle circuit

04.031 Install a three phase receptacle circuit

04.032 Comply with basic National Electrical Code requirements

05.0 INSTALL TRANSFORMERS—The student will be able to:

05.001 Connect a single-phase step-down transformer

05.002 Connect a single-phase step-up transformer

05.003 Connect two single-phase transformers in parallel

05.004 Connect two single-phase transformers in an open-delta configuration

05.005 Connect a dual-voltage transformer (for high-voltage input and output)

05.006 Connect a dual-voltage transformer (for low-voltage input and output)

05.007 Connect an auto-transformer to give a variety of output voltages

05.008 Connect a single-phase distribution transformer to supply 115 and 230 volts

05.009 Connect a three-phase power transformer for a three-phase, four-wire connection

05.010 Connect a three-phase transformer for a three-phase, delta configuration

05.011 Connect a three-phase power transformer for a three-phase, wye configuration

05.012 Connect three single-phase transformers to form a delta-delta configuration

05.013 Connect three single-phase transformers to form a delta-star configuration

05.014 Connect three single-phase transformers to form a star-delta three-phase configuration

05.015 Connect three single-phase transformers to form a star-star, three-phase configuration

05.016 Install a current transformer and measure current flow

05.017 Install a potential transformer and measure voltage

05.018 Connect a booster transformer

05.019 Connect a bucking transformer

06.0 OPERATE AC AND DC ROTATING EQUIPMENT—The student will be able to:

06.001 Connect a DC shunt motor

06.002 Connect a DC series motor

06.003 Connect a DC compound motor

06.004 Connect a DC separately-excited shunt generator

06.005 Connect a DC self-excited shunt generator

06.006 Connect a DC compound generator

06.007 Connect a DC series generator

06.008 Connect a capacitor-start motor

06.009 Connect a split-phase induction motor

06.010 Connect a capacitor-run motor

06.011 Connect a universal motor

06.012 Connect a repulsion-start, induction-run motor

06.013 Connect a three-phase wound-rotor induction motor

06.014 Connect a three-phase squirrel-cage induction motor

06.015 Connect a three-phase synchronous motor

06.016 Connect a three-phase alternator

07.0 CONSTRUCT CONTROL CIRCUITS AND INSTALL ELECTRICAL CONTROLS AND DEVICES—The student will be able to:

07.001 Draw an elementary motor-control line diagram

07.002 Install a manual motor-control station

07.003 Install an automatic, push-button motor-control station

07.004 Install a three-phase-control magnetic starter

07.005 Install a two-station, push-button control station

07.006 Install a drum-switch control station

07.007 Install a control circuit to change the direction of rotation of a motor

07.008 Install a hands-off, automatic control circuit

07.009 Install a multiple push-button station

07.010 Install an interlocking/reversing control circuit

07.011 Install a hand-sequence control circuit

07.012 Install an AC reduced-voltage starter (resistance)

07.013 Install a part-winding starter

07.014 Install a three-phase multispeed controller

07.015 Install a direct-current motor controller

08.0 REPAIR MOTORS—The student will be able to:

08.001 Disassemble and assemble a DC motor

08.002 Disassemble and assemble a single-phase motor

08.003 Disassemble and assemble a three-phase motor

08.004 Install and connect a motor starting switch

08.005 Install a motor centrifugal mechanism

08.006 Install motor bearings and bushings

08.007 Troubleshoot and repair a DC motor

08.008 Troubleshoot and repair a single-phase motor

08.009 Troubleshoot and repair a three-phase motor

09.0 DEMONSTRATE EMPLOYABILITY SKILLS—The student will be able to:

09.001 List sources of job openings other than public or private employment agencies

09.002 Write a letter of application for a job

09.003 Prepare a resume or personal fact sheet

09.004 List factors to consider when applying for a job

09.005 List ways of making contact with employers

09.006 Identify documents which may be required when applying for a job interview

09.007 Complete a job application form correctly

09.008 Identify appropriate dress and grooming for a job interview

09.009 Classify behaviors considered to be appropriate in a job interview situation

09.010 Describe the advantages to the employer and employee of being a productive worker

09.011 Explain the purpose of supervision, self-discipline, and performance evaluation

09.012 Identify appropriate response(s) to criticism from employer, supervisor, or other employees

09.013 List consequences of being absent frequently from the job

09.014 List consequences of frequently arriving late for work

09.015 List factors to consider when resigning from a job

09.016 Write a letter of resignation

09.017 Interact with customers

09.018 Locate local and regional job opportunities

DRAFT RECOMMENDATIONS AS OF 1/1/86

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Commercial and Industrial Electricity

CODE NUMBER: Secondary __________ Postsecondary ETI0810

Florida CIP IN47.019902

SECONDARY SCHOOL CREDITS _____ COLLEGE CREDITS _____ POSTSECONDARY ADULT VOCATIONAL CREDITS _____

APPLICABLE LEVELS(S): __7-9 __9-12 __Postsecondary Adult Vocational

__Postsecondary Vocational X Other (13-17)

CERTIFICATION COVERAGE: ELECTRICAL 7 TEC ELEC @ 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as electricians, industrial (826.361-010) and electrician helpers, industrial (829.684-022), or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and assembly, installation, operation, maintenance, and repair of electrical/electronic equipment used in industry and manufacturing.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in residential, commercial, and industrial wiring; servicing, maintaining, and using equipment, including lighting, conduit (raceway) systems, motors, and related equipment following the National Electrical Code, as well as hydraulic, pneumatic, and electronic controls and alarm systems.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing communicatons, leadership, human relations, and employability training experiences and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal.

In accordance with Section 240.149 F.S., the minimum basic skills grade level required for this postsecondary adult vocational program is: Mathematics 7.0, Language 7.0. This grade level number corresponds to a grade equivalent score obtained on a state designated basic skills examination.

The typical length of this program for the average achieving student is 1800 contact hours (2160 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the individual will be able to:

01. Demonstrate proficiency in laboratory practices
02. Demonstrate proficiency in DC circuits
03. Demonstrate proficiency in AC circuits
04. Demonstrate proficiency in electronic components and circuits
05. Demonstrate proficiency in basic logic circuits
06. Demonstrate industrial wiring skills
07. Install transformers
08. Operate AC and DC rotating equipment
09. Construct control circuits and install electrical controls and devices.
10. Repair motors
11. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS

COMMERCIAL AND INDUSTRIAL ELECTRICITY

01.0 DEMONSTRATE PROFICIENCY IN LABORATORY PRACTICES--The student will be able to:

01.001 Apply laboratory policies and procedures
01.002 Apply laboratory safety rules and procedures
01.003 Demonstrate the operation of laboratory safety devices
01.004 Demonstrate personal safety procedures
01.005 Demonstrate first aid/emergency treatment procedures
01.006 Apply fire safety rules and procedures
01.007 Apply electrical safety rules and procedures
01.008 Demonstrate procedures for disaster situations
01.009 Solve problems requiring addition, subtraction, multiplication and division of whole numbers
01.010 Solve problems requiring addition, subtraction, multiplication and division of common fractions
01.011 Solve problems requiring addition, subtraction, multiplication and division of decimal numbers
01.012 Convert decimals to fractions and fractions to decimals
01.013 Convert English measure to metric measure and metric measure to English measure
01.014 Solder and desolder components

01.015 Drill holes in metal or plastic chassis

01.016 Measure voltage in a simple circuit

01.017 Measure amperage in a simple circuit

01.018 Measure resistance in a simple circuit

01.019 Produce a voltage by chemical means

01.020 Produce a voltage by mechanical means

01.021 Produce a voltage by thermal means

01.022 Produce a voltage by photoelectric means

01.023 Identify physical and mechanical abilities of the electrical trade

01.024 Demonstrate use & care of ladders

01.025 Demonstrate use & care of tools

01.026 Demonstrate use of shovels & axes

01.027 Prepare a trench for conduit

01.028 Backfill and compact a conduit trench

01.029 Organize storage areas on site

01.030 Demonstrate service truck loading procedures

01.031 Perform daily maintenance on servie trucks

01.032 Demonstrate rigging procedures using ropes, cables, and chains

01.033 Identify use of rigging hand signals for crane operators

02.0 DEMONSTRATE PROFICIENCY IN DC CIRCUITS--The student will be able to:

02.001 Solve basic algebraic problems as applicable to electricity/electronics (prerequisite to DC)
02.002 Relate electricity to the nature of matter
02.003 Identify sources of electricity
02.004 Define voltage, current, resistance, power, and energy
02.005 Apply and relate Ohm's Law
02.006 Measure properties of a circuit using VOM and DVM meters
02.007 Compute and measure conductance and resistance of conductors and insulators
02.008 Analyze series circuits
02.009 Construct series circuits
02.010 Troubleshoot series circuits
02.011 Draw a series circuit and calculate circuit values
02.012 Analyze parallel circuits
02.013 Construct parallel circuits
02.014 Troubleshoot parallel circuits
02.015 Draw a parallel circuit and calculate circuit values
02.016 Analyze series-parallel circuits
02.017 Construct series-parallel circuits
02.018 Troubleshoot series-parallel circuits
02.019 Draw a series-parallel circuit and calculate circuit values
02.020 Define magnetic properties of circuits and devices

02.021 Determine physical and electrical characteristics of capacitors and inductors

02.022 Analyze and measure RL and RC time constants

02.023 Set up and operate a VOM for DC circuits

02.024 Set up and operate a DVM for DC circuits

02.025 Set up and operate power supplies for DC circuits

02.026 Set up and operate oscilloscopes for DC circuits

02.027 Construct an electromagnet

02.028 Construct a simple DC generator

02.029 Construct a simple DC motor

02.030 Analyze filter circuits

02.031 Construct filter circuits

02.032 Troubleshoot filter circuits

02.033 Set up and operate frequency counters for DC circuits

02.034 Set up and operate signal generators for DC circuits

02.035 Set up and operate capacitor-inductor analyzers for DC circuits

03.0 DEMONSTRATE PROFICIENCY IN AC CIRCUITS--The student will be able to:

03.001 Solve basic trigonometric problems as applicable to electricity/electronics (prerequisite to AC)

03.002 Identify properties of an AC signal

03.003 Identify AC sources

03.004 Analyze and measure AC signals using oscilloscope, frequency meters, and generators

03.005 Analyze AC capacitive circuits

03.006 Construct AC capacitive circuits

03.007 Troubleshoot AC capacitive circuits

03.008 Analyze AC inductive circuits

03.009 Construct AC inductive circuits

03.010 Troubleshoot AC inductive circuits

03.011 Analyze and apply principles of transformers to AC circuits

03.012 Analyze RLC circuits (series, parallel, complex)

03.013 Construct RLC circuits (series, parallel, complex)

03.014 Troubleshoot RLC circuits (series, parallel, complex)

03.015 Analyze series and parallel resonant circuits

03.016 Construct series and parallel resonant circuits

03.017 Troubleshoot series and parallel resonant circuits

03.018 Analyze polyphase circuits

03.019 Construct polyphase circuits

03.020 Troubleshoot polyphase circuits

03.021 Analyze basic motor theory and operation

03.022 Analyze basic generator theory and operation

03.023 Set up and operate a VOM for AC circuits

03.024 Set up and operate a DVM for AC circuits

03.025 Set up and operate power supplies for AC circuits

03.026 Set up and operate impedance bridges for AC circuits

03.027 Display and read waveforms

03.028 Insert a capacitor in series in an AC circuit

03.029 Develop a time constant curve

03.030 Insert inductors in series in an AC circuit

03.031 Construct a series RL circuit

03.032 Measure voltage across a resistor and an inductor at varying frequencies in a series RL circuit

03.033 Measure voltage across a resistor and an inductor at various values of resistance in a series RL circuit

03.034 Measure voltage across a resistor and an inductor at various values of inductance in a series RL circuit

03.035 Construct a parallel RL circuit

03.036 Measure current through a resistor and an inductor at varying frequencies in a parallel RL circuit

03.037 Measure current through a resistor and an inductor at various values of resistance in a parallel RL circuit

03.038 Measure current through a resistor and an inductor at various values of inductance in a parallel RL circuit

03.039 Construct a series RC circuit

03.040 Measure voltage across a resistor and a capacitor at varying frequencies in a series RC circuit

03.041 Measure voltage across a resistor and a capacitor at various values of resistance in a series RC circuit

03.042 Measure voltage across a resistor and a capacitor at various values of capacitance in a series RC circuit

03.043 Construct a parallel RC circuit

03.044 Measure current through a resistor and a capacitor at varying frequencies in a parallel RC circuit

03.045 Measure current through a resistor and a capacitor at various values of resistance in a parallel RC circuit

03.046 Measure current through a resistor and a capacitor at various values of capacitance in a parallel RC circuit

03.047 Construct a series RLC circuit

03.048 Measure voltage across a resistor, a capacitor, and an inductor at varying frequencies in a series RLC circuit

03.049 Measure voltage across a resistor, a capacitor, and an inductor at various values of resistance in a series RLC circuit

03.050 Measure voltage across a resistor, a capacitor, and an inductor at various values of capacitance in a series RLC circuit

03.051 Measure voltage across a resistor, a capacitor, and an inductor at various values of inductance in a series RLC circuit

03.052 Construct a parallel RLC circuit

03.053 Measure current through a resistor, a capacitor, and an inductor at varying frequencies in a parallel RLC circuit

03.054 Measure current through a resistor, a capacitor, and an inductor at various values of resistance in a parallel RLC circuit

03.055 Measure current through a resistor, a capacitor, and an inductor at various values of capacitance in a parallel RLC circuit

03.056 Measure current through a resistor, a capacitor, and an inductor at various values of inductance in a parallel RLC circuit

03.057 Read and interpret color codes to identify resistors

03.058 Analyze voltage dividers (loaded and unloaded)

03.059 Construct voltage dividers (loaded and unloaded)

03.060 Troubleshoot voltage dividers (loaded and unloaded)

03.061 Solve network theorem problems using Kirchoff, (V and I), Thevenin, Norton, Superposition, and Delta-Wye

03.062 Analyze maximum power transfer theory

03.063 Construct maximum power transfer theory

03.064 Troubleshoot maximum power transfer theory

04.0 DEMONSTRATE PROFICIENCY IN ELECTRONIC COMPONENTS AND CIRCUITS—The student will be able to:

04.001 Test semiconductor diodes

04.002 Test thyristors

04.003 Test bipolar transistors

04.004 Test unijunction transistors

04.005 Test circuit protection devices

04.006 Construct a half-wave low-voltage power supply circuit

04.007 Construct a full-wave low-voltage power supply circuit

04.008 Construct a full-wave low-voltage regulated power supply circuit

04.009 Construct a full-wave bridge-rectifier power supply circuit

04.010 Construct a UJT relaxation oscillator circuit

05.0 DEMONSTRATE PROFICIENCY IN BASIC LOGIC CIRCUITS—The student will be able to:

05.001 Convert decimal numbers to binary numbers

05.002 Convert decimal numbers to octal numbers

05.003 Solve problems using Boolean algebra

05.004 Construct an AND gate circuit

05.005 Construct an OR gate circuit

05.006 Construct an inverter circuit

05.007 Construct a NAND gate circuit

05.008 Construct a NOR gate circuit

05.009 Construct an exclusive OR gate circuit

05.010 Construct an RS and steered flip-flop

05.011 Construct a J-K flip-flop

05.012 Construct a logic counter circuit

05.013 Construct a logic addition and subtraction circuit

05.014 Construct a logic multiplication and division circuit

05.015 Construct a logic memory circuit

06.0 DEMONSTRATE INDUSTRIAL WIRING SKILLS--The student will be able to:

06.001 Obtain electrical wiring installation requirements from an industrial electrical plan/drawing

06.002 Draw an industrial electrical floor plan

06.003 Charge a lead-acid battery

06.004 Charge a nickle-cadmium battery

06.005 Repair an emergency lighting system

06.006 Correct the power factor on a system

06.007 Install a bus duct

06.008 Install bundled wiring in mounted lay-in duct work

06.009 Install circuit breakers in a panel board

06.010 Install a circuit using non-metallic sheathed cable

06.011 Install and connect system grounds

06.012 Install a distribution panel board

06.013 Install electrical metallic tubing

06.014 Install explosion-proof equipment

06.015 Install power and controls for A/C systems

06.016 Install a fluorescent lighting fixture

06.017 Install an incandescent lighting fixture

06.018 Install a lighting dimmer system

06.019 Install liquid-tight flexible metal conduit

06.020 Install multi-conductor cable

06.021 Install a multi-conduit layout

06.022 Install a multi-control lighting circuit

06.023 Install non-liquid-tight flexible metal conduit

06.024 Install plastic conduit

06.025 Install plug-in duct work

06.026 Install a power-feeder wiring system to machinery

06.027 Install a public address system

06.028 Install analog systems

06.029 Install digital communications cabling

06.030 Install fiber-optics communications cabling

06.031 Install rigid conduit

06.032 Install the service-entrance head for a service drop

06.033 Install underfloor duct work

06.034 Install an underground service entrance

06.035 Install and terminate high-voltage cable

06.036 Operate high-voltage test equipment

06.037 Use a megger (test kit) to test insulation

06.038 Prepare an equipment and material list

06.039 Complete an equipment and material order

06.040 Receive an equipment and material order

06.041 Install thin wall (EMT) conduit

06.042 Install a single phase receptacle circuit

06.043 Install a three phase receptacle circuit

06.044 Comply with basic National Electrical Code requirements

07.0 INSTALL TRANSFORMERS--The student will be able to:

07.001 Connect a single-phase step-down transformer

07.002 Connect a single-phase step-up transformer

07.003 Connect two single-phase transformers in parallel

07.004 Connect two single-phase transformers in an open-delta configuration

07.005 Connect a dual-voltage transformer (for high-voltage input and output)

07.006 Connect a dual-voltage transformer (for low-voltage input and output)

07.007 Connect an auto-transformer to give a variety of output voltages

07.008 Connect a single-phase distribution transformer to supply 115 and 230 volts

07.009 Connect a three-phase power transformer for a three-phase, four-wire connection

07.010 Connect a three-phase transformer for a three-phase, delta configuration

07.011 Connect a three-phase power transformer for a three-phase, wye configuration

07.012 Connect three single-phase transformers to form a delta-delta configuration

07.013 Connect three single-phase transformers to form a delta-star configuration

07.014 Connect three single-phase transformers to form a star-delta three-phase configuration

07.015 Connect three single-phase transformers to form a star-star, three-phase configuration

07.016 Install a current transformer and measure current flow

07.017 Install a potential transformer and measure voltage

07.018 Connect a booster transformer

07.019 Connect a bucking transformer

08.0 OPERATE AC AND DC ROTATING EQUIPMENT--The student will be able to:

08.001 Connect a DC shunt motor

08.002 Connect a DC series motor

08.003 Connect a DC compound motor

08.004 Connect a DC separately-excited shunt generator

08.005 Connect a DC self-excited shunt generator

08.006 Connect a DC compound generator

08.007 Connect a DC series generator

08.008 Connect a capacitor-start motor

08.009 Connect a split-phase induction motor

08.010 Connect a capacitor-run motor

08.011 Connect a universal motor

08.012 Connect a repulsion-start, induction-run motor

08.013 Connect a three-phase wound-rotor induction motor

08.014 Connect a three-phase squirrel-cage induction motor

08.015 Connect a three-phase synchronous motor

08.016 Connect a three-phase alternator

09.0 CONSTRUCT CONTROL CIRCUITS AND INSTALL ELECTRICAL CONTROLS AND DEVICES—The student will be able to:

09.001 Draw an elementary motor-control line diagram
09.002 Install a manual motor-control station
09.003 Install an automatic, push-button motor-control station
09.004 Install a three-phase-control magnetic starter
09.005 Install a two-station, push-button control station
09.006 Install a drum-switch control station
09.007 Install a control circuit to change the direction of rotation of a motor
09.008 Install a hands-off, automatic control circuit
09.009 Install a multiple push-button station
09.010 Install an interlocking/reversing control circuit
09.011 Install a hand-sequence control circuit
09.012 Install a timed-sequence control circuit
09.013 Install an automatic-sequence control circuit
09.014 Install an AC reduced-voltage starter (resistance)
09.015 Install a part-winding starter
09.016 Install a three-phase multispeed controller
09.017 Install a direct-current motor controller
09.018 Connect a pilot-motor-driven motor-timing control
09.019 Connect a capacitor timing starter
09.020 Install a jogging control circuit
09.021 Install a plugging control circuit
09.022 Install an electric breaking device

09.023 Install a direct-drive station

09.024 Install a gear-motor station

09.025 Construct a linear voltage regulator

09.026 Construct a switching voltage regulator

09.027 Construct an electronic wiring circuit

09.028 Construct a photoelectric relay circuit

09.029 Construct an operational amplifier circuit

09.030 Construct a transistor speed-control circuit

09.031 Construct a closed-loop speed-control circuit

09.032 Construct a pulse-width speed-control circuit

09.033 Construct a Triac speed-control circuit

09.034 Operate digital control systems for computer control systems

09.035 Install solid-state motor control systems

09.036 Install digital control systems (computer systems)

09.037 Construct a basic SCR speed-control circuit

09.038 Construct a pulse-triggered SCR speed-control circuit

09.039 Construct a closed-loop SCR speed-control circuit

09.040 Construct a tachometer-feedback speed-control circuit

10.0 REPAIR MOTORS--The student will be able to:

10.001 Disassemble and assemble a DC motor

10.002 Disassemble and assemble a single-phase motor

10.003 Disassemble and assemble a three-phase motor

10.004 Prepare a motor data card

10.005 Wind a DC motor

10.006 Wind a single-phase motor

10.007 Wind a three-phase motor

10.008 Install and connect a motor starting switch

10.009 Install a motor centrifugal mechanism

10.010 Install motor bearings and bushings

10.011 Troubleshoot and repair a DC motor

10.012 Troubleshoot and repair a single-phase motor

10.013 Troubleshoot and repair a three-phase motor

11.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

11.001 List sources of job openings other than public or private employment agencies

11.002 Write a letter of application for a job

11.003 Prepare a resume or personal fact sheet

11.004 List factors to consider when applying for a job

11.005 List ways of making contact with employers

11.006 Identify documents which may be required when applying for a job interview

11.007 Complete a job application form correctly

11.008 Identify appropriate dress and grooming for a job interview

11.009 Classify behaviors considered to be appropriate in a job interview situation

11.010 Describe the advantages to the employer and employee of being a productive worker

11.011 Explain the purpose of supervision, self-discipline, and performance evaluation

11.012 Identify appropriate response(s) to criticism from employer, supervisor, or other employees

11.013 List consequences of being absent frequently from the job

11.014 List consequences of frequently arriving late for work

11.015 List factors to consider when resigning from a job

11.016 Write a letter of resignation

11.017 Interact with customers

11.018 Locate local and regional job opportunities

INSTRUCTIONAL APPROACH

Local decisions must be made by school administrators & teachers concerning the appropriate methods to use to deliver instruction & measure student achievement. In many instances, a mix of various instructional approaches may be deemed appropriate to present instruction in a comprehensive and efficient manner. It is the teacher's responsibility to ensure that students learn how to competently perform the tasks specified in the course objectives. The teacher must lead the students through the learning experiences in a course. This leadership role requires the teacher to motivate students to aggressively pursue learning activities. The teacher must select the methods of instruction that best apply to the students ability levels and that allow the teacher to control the learning processes, to measure student achievement, and to provide feedback to the student.

KEY FACTORS TO CONSIDER

—Student Characteristics

Adolescent - Immature students need constant control, a high degree of motivational leadership, and relatively simple learning activities.

Adult - Mature students are more often self-motivated, need less control, and can accept complex learning activities.

Prerequisites - Can the student read, write, calculate mathmatics, and understand English language at the ability level required to complete learning activities.

—Teacher Characteristics

Subject Knowledge - The teacher must be a subject matter expert—must be able to teach instructional concepts and evaluate student performance. Should have significant amount of experience actually working in industry/vocational area.

Instructional Delivery - The teacher must motivate and lead the student as well as know how to organize and present various types of instruction. Innovative instructional methods should not be attempted if the instructor is not qualified to use them.

Instructional Development - Teachers must select materials, and often develop their own materials, to be used by students. The materials used must support the methods of delivery. The teacher must be qualified to select and develop course materials, or else use instructional packages developed by other qualified sources.

Instructional Measurement - Teachers must select testing methods that support the instructional delivery system used. Teachers must be qualified to develop, administer, and evaluate both written and performance type tests.

—Instructional Setting Characteristics

Time Constraints - Traditional methods of instruction in school systems are controlled by the time periods available. Instruction must be made to fit the time available for training unless the time constraints are removed. If time constraints are not a factor, innovative methods of instruction may be appropriate such as:

- open-entry/open-exit
- self-paced/independent study
- computer based instruction

- competency based instruction

Facilities and Equipment - Instructional methods selected must take into consideration the space available, the number of work stations for students and the amount of tools and equipment available for student use.

CONVENTIONAL INSTRUCTIONAL METHODS:

Any given course of instruction may require some instruction to be presented in a standard lecture or controlled demonstration format. These methods of instruction can be easily combined with instructor controlled step-by-step practical exercises. Some instructional activities may dictate that this instructional approach be used to introduce students to hazardous equipment often utilized in vocational training. In most situations, students should be required to perform specified activities to achieve skill competency. If mastery of a task is required, competency-based education methods may be more appropriate. If the training activity envolves an orientation or a seldom performed nonessential task, conventional instructional methods are acceptable.

COMPETENCY-BASED VOCATIONAL EDUCATION INSTRUCTIONAL METHODS:

The focus of Competency-based Vocational Education (CBVE) is to ensure that each student can competently perform tasks specified in an objective statement. Competency-based instruction can be included in conventional instructional settings as well as innovative settings. CBVE does not require self-paced/individualized methods of instructional delivery to be used as the only means for CBVE instruction.

CBVE PRINCIPLES AND CHARACTERISTICS

1. The curriculum is based on well defined, job related tasks or competencies. The curriculum should be designed to have students do things, not just read resources, or view AV materials.

2. Each period or unit of instruction contains a performance objective, stated in terms of observable, measurable activities.

3. Teachers provide students with a list of the performance objectives, the standards to be met and other performance criteria.

4. Teachers may utilize any appropriate method of instruction to present the subject matter to students. Teachers can mix various methods together in any given program, or course, or unit of instruction, to achieve the most efficient means for the students to learn the subject matter and competently perform the task as specified in the objective. Possible methods of instruction used in CBVE programs may include:

    —Group paced lectures and demonstrations.

    —Instructor controlled practice activities.

    —Self-paced instruction for individual learning activities and repeated practice.

    —Small group or team teaching methods where several students work together on a piece of equipment or a project, or activity.

5. Teachers must have a method of recording each student's achievement for each performance objective. This can be in the form of a record book, or a progress chart, a check off sheet, or a series of well planned performance tests.

6. Teachers must inform each student that they have either met the criteria specified for each performance objective or they have not adequately performed the task. The student must be informed of any inadequate performance and provided the opportunity and resources to practice performing the task until adequate performance is attained. This is probably the most difficult aspect of managing CBVE instruction, for it requires the teacher to individually coach or tutor a student for a controlled period of time, requiring the student to practice performing the task several times, and ultimately making the decision that the student is either competent at the task or not competent. The teacher may limit the time allowed for repeated task practice.

7. Student performance is evaluated in comparison to the standards and performance criteria stated in the objective, not to the performances of other students. If performance meets the standard, the student passes the objective 100%. If the student does not meet all the criteria specified, the student is not 100% competent in performance of the task and should not be given credit for completing the task. The student can be given an incomplete grade if continued attempts will be made to pass the objective.

8. Teachers may use both performance tests and written tests to determine competency. Written tests can be used to measure knowledge of performance procedures, equipment identification, math and science abilities, etc. Performance tests can be used for actual student performance of a task, to a prescribed standard, under specified conditions.

CBVE GOALS

The goal of Competency-Based Vocational Education is to have all students reach the specified standard of competency. Instructional methods, quantity of instruction, and performance evaluation methods will vary according to the instructional situation. CBVE instruction allows for the use of a multitude of instructional resources and procedures, including individual self-paced units of instruction to allow the student to master the objective. This approach differs from traditional instruction in which all students use the same materials and spend the same amount of time in a course where student achievement is expected to vary—not the instructional approach.

TEACHER AND STUDENT ROLES IN CBVE

The requirements of competency-based vocational education have major implications for the roles that teachers and students perform and for the kinds of skills that teachers need. In competency-based settings, teachers must not only be dispensers of information; but they must also become managers of a variety of instructional resources that they select and use to tailor instruction to the needs of individual learners. Teachers spend less time providing content information and much more time helping individuals master objectives. In a competency-based setting, the teacher may present some group instruction as well as develop alternative resources, and function as a tutor and a counselor, a diagnostician of learner needs, a prescriber of instructional experience, and an evaluator of competent performance.

The teacher in this setting has, then, a more complex, varied, and rewarding role than ever before. Teachers need to be able to design their course or programs around measureable, job-related skills and to ensure that these skills are, indeed, necessary for obtaining and keeping a job. They must be able to state objectives clearly and in a way that permits objective measurement. Teachers must be able to carry out this measurement in a way that accurately assesses student achievement and that exactly reflects what the competency really involves.

Teachers must also be able to adapt their instruction to individual learning needs so that each student can acquire the competencies (s)he needs. This ability to tailor instruction demands knowledge of a wide variety of individualization strategies, as well as skill in applying these strategies systematically.

A major assumption underlying CBVE is that students who are actively involved in carrying out their programs of study will learn more and retain more than students who passively accept information fed to them. Thus, an important part of the teacher's job is to encourage students to assume more and more responsibility for their own learning.

Because students are doing many different kinds of things, and because the teacher must coordinate the activities of all the students in a course, the individual student's role inevitably involves more responsibility than it does in traditional settings.

Many of the basic management tasks that teachers formerly undertook by themselves-tasks such as record keeping, monitoring student progress, and monitoring the use of resources-must become the joint responsibility of teachers and students in a competency-based setting.

Some teachers worry that giving students more responsibility will result in a loss of teacher control. On the contrary, however, most teachers find that the have more control in a competency-based setting than in a traditional, group-oriented setting. The teacher has, after all, designed the system or environment in which students must operate; without the teacher there to manage the overall system, it would soon cease to function.

INSTRUCTIONAL CONCEPTS:

Instruction should be systematic and reflect program goals. A list of competencies and specific performance objectives with criterion-referenced measures should be used.

1. Program Plan

   The training program should progress in logical steps and provide for alternate sequences, where applicable.

2. Student training plan

   A training plan for each student should be used, indicating the student's training goal(s) and specific steps needed to meet each goal. Every student should be given a copy of his/her training plan.

3. Preparation Time

   Adequate time should be provided for teacher preparation and program development and/or modification.

4. Teaching Load

   The instructor/student ratio and class contact hours should allow time for interaction on a small-group and a one-to-one basis.

5. Curriculum

   a. The specific competencies in the Career MAP Competency List should be included in each area of program-specific instruction. Additional competencies may be added to meet the needs of local employers. All additional competencies should be approved by the program advisory committee.

   b. Instructions on the legal aspects and responsibilities in areas such as Environmental Protection Agency regulations, safety regulations, OSHA regulations, and other appropriate requirements should be included in the curriculum. Instruction and practice in filling out work order forms, ordering parts or supplies, and basic record-keeping should be a part of the training program.

6. Student Progress

   A record of each student's progress should be maintained through use of the Career MAP or another type of Progress Chart. The record should indicate the competencies required for mastery and those competencies the student has mastered.

7. Performance Standards

   Instruction should be performance based, with an acceptable perfomace standard stated for each task. These standards should be shared with students and potential employers.

Students should demonstrate "hands on competency" or "mastery" of a competency before the instructor verifies the student's performance.

8. **Safety Standards**

   Safety instruction must be given prior to shop work and be an integral part of the training program. A safety test must be included in the training program. Eye protection must be worn in any shop/lab area, when required.

9. **Personal Characteristics**

   All training activities and instructional material should emphasize the importance of maintaining high personal characteristics. Employability skills training and evaluation should be integrated throughout the training program.

10. **Provisions for Individual Difference**

    The training program should be structured in such a manner that students with different levels of cognitive and psychomotor skills can be accomodated.

11. **Related Instruction**

    Instruction in related mathematics, communication, and interpersonal relations should be provided and coordinated with ongoing instruction in the training program. This instruction should be provided by a qualified instructor.

12. **Testing**

    Both written and performance-based tests must be used to validate student competency. Students should be encouraged to take certification tests that are publicly recognized indicators of capabilities.

COURSE OUTLINE/SAMPLE LESSON PLAN

Units of instruction used by Vocational Education teachers must be correlated to the Curriculum Frameworks, and Student Performance Standards. The Curriculum Framework provides the basis for developing the course outline. Each school should utilize the resources and modules that apply to the scope of their program and the various methods of instruction their situation dictates.

Teachers may develop their individual course outlines using the resources and instructional material contained in the last section of this guide. They may also develop their own units of instruction as they feel may be necessary to meet the intended outcomes stipulated in the Curriculum Framework. The number and order of presentation of the modules can be varied to fit the objectives of the course.

For example, a school may elect to go into depth in only a few of the modules, or it may decide to cover a wider range of modules but in less depth. This program can be offered for a single semester or for two or more semesters, depending upon the local situation. A student should not be given credit for enrolling in the same component of instruction more than one time.

SAMPLE COURSE OUTLINE

Vocational teachers should prepare a comprehensive outline of subjects to study for each course they teach. Each student should be provided a copy of the course outline. Teachers may use any format they desire for the outline, and should include the following information on the course outline.

Recommended Course Outline Contents

1. Course name.
2. Course number (state directory number and/or local number).
3. Course start date or individual start date.
4. Identification of time periods for study if applicable.
5. Identification of place or room/facility for study or practical work.
6. Identification of teacher/instructor/assistants responsible for instruction and/or evaluation.
7. Identification of units or subjects to study (objectives) or competencies, etc., including Task # or Duty #.
8. Identification of primary resources or references available to study.
9. Identification of major practical exercise work, projects, or activities to perform.
10. Identification of major tests or examinations to be administered.

SAMPLE COURSE OUTLINE FORMAT

Course Name ______________________

Course Number ______________________

Course Dates ______________________

Instruction unit or period	Duty or Task # Module	Subject/ Objective/	location	Instructor	Reference

Lesson Plans/Teachers Guides & Student Guides

Teachers should prepare lesson plans or teachers guides & student guides for subjects on the course outline. Lesson plans are appropriate for traditional periods of instruction whereas teachers guides may be more appropriate for other types of instructional activities. Student learning guides may be used for traditional periods of instruction but they become a necessity for self-paced learning activities. Teachers guides contain all instructional information as well as tests & answer keys, whereas student learning guides contain only student information.

A sample student learning guide is provided in the following pages. This sample is an example of the material a teacher would provide students with for self-study in a competency-based course activity. Each page of the sample contains a different topic for the sake of illustration only. An actual student learning guide would be written around only one objective.

SCHOOL NAME & LOGO

A Business Education | A STUDENT LEARNING GUIDE

B TASK: Write Letters Of Application

C DUTY: Applying For A Job

D PURPOSE:

A letter of application is your introduction to a potential employer. The purpose of this letter is to get an interview and a job. A prospective employee who can prepare effective application letters is one step ahead of the competition.

E

Dept.	Prog.	Duty	Task	Prereq.
BU	*	JA	02	JA-01

Each learning guide has a cover page like the sample above that contains the following items:

A. the name of the program

B. the task-a statement of exactly what you will be able to do or know when you complete the learning guide.

C. the duty-the broad unit in which this task is found.

D. the purpose-a statement of why it is important to attain the task.

E. identifying information such as department, program, duty, task, and prerequisite. The prequisite in the box on the far right tells you that you must have already attained the task identified there before proceeding to attain the one in the present learning guide.

STUDENT PERFORMANCE OBJECTIVES:

A TERMINAL PERFORMANCE OBJECTIVE:

B **GIVEN:** plans and a residential site.

C **YOU WILL:** construct and set forms for a continuous footing.

D **HOW WELL:** You must successfully complete the Written Test and score 100% on the Performance Test.

ENABLING OBJECTIVES:

1. Identify styles, uses and parts of forms.
2. Prepare for constructing continuous footings.
3. At a school work station, construct and set forms for a continuous footing.

E

Dept.	Prog.	Duty	Task
IN	9163	F	01

The student performance objective page, similar to the sample you see above, contains the following information:

A. the terminal performance objective (TPO)-the broad heading that encompasses the three items beneath it and states in detail what will be expected of you at the end of the learning guide

B. the given-a statement of what will be provided when you take the written or performance test

C. the you will-a statement of what will be required to attain the task

D. the how well-a statement of the degree of performance excellency required to attain the task

E. the enabling objectives (EO's)-the steps to be taken in attaining the task

A ENABLING OBJECTIVE NO. 2

B Disassemble fuel injector and inspect parts.

C

LEARNING STEPS	RESOURCES
1. Disassemble injector.	1. a. Needle valve injector b. Mechanic' tool set c. Injector tools
2. When completed, evaluate your work using the Self-check.	2. Self-Check enclosed
3. Have instructor evaluate your recordings.	3. Instructor
4. Go on to Enabling Objective No.3.	

E

Dept.	Prog.	Duty	Task	EN.OBJ.
IN	9123	C	05	2

The enabling objectives are the heart of the learning guide. They provide detailed steps of what to do and when to do it.

There is an enabling objective page for each EO listed on the student performance objective page. The EO page resembles the sample above, and contains the following information:

A. the number of the EO being learned

B. a restatement of the EO as it appeared in the student performance objective

C. the learning steps-they tell you what to do

D. the resources-they tell you what items you will need to complete the steps

INSTRUCTION SHEET

Mounting Tires

Follow the procedure below for mounting a tire on a rim. Pay close attention to all safety precautions.

CAUTION: WEAR SAFETY GLASSES AT ALL TIMES!

1. Visually inspect tire for any wear or damage.
2. Place the rim on the changer with the narrowest flange up — hand tighten centering cone.
3. Lubricate bead of tire with soap solution.
4. Place tire in position on the rim with as much bead over the rim flange as possible. This provides a starting position for bead lifting tool.
5. Attach the air hose for inflating the tire.

CAUTION: KEEP THE HANDS AND BODY AWAY FROM TIRE WHILE INFLATING. IF THE TIRE SHOULD EXPLODE YOU COULD BE INJURED!

Dept.	Prog.	Duty	Task	En Obj
IN	9043	B	02	2

The procedure in using the EO page is to follow each learning step in sequence. The first several learning steps will tell you to read or view particular resources identified to the right of the step (see #2 on the sample EO page). Other learning steps will ask you to practice or apply the knowledge or skill (see #3 on the sample). Another learning step will identify the type of feedback used in evaluating the skill or knowledge called for in the EO. Often this is a self-check (see #4 on the sample). Some learning guides will have instruction sheets on the order of the above sample.

SELF-CHECK

DIRECTIONS

Evaluate your work using the items listed below. All items should receive a "yes" response.

	YES	NO
1. Was the stocked area layed out with a pencil and chalk line?	___	___
2. Did each end of the stock area begin with a stack of blocks?	___	___
3. Was the line hung on the left lead first?	___	___
4. Was the line hung in 45 seconds?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

Dept.	Prog.	Duty	Task	En Obj.
IN	9133	B	18	2

The self-check gives you immediate feedback on how well your learning is progressing.

WRITTEN TEST FOR TASK NO. ____

TASK:	Demonstrate and use Ohm's Law

Directions

The purpose of this test is to determine if you fully understand how to demonstrate and use Ohm's Law. To successfully complete this test, all items must be answered correctly.

The items below are Multiple Choice. On the separate answer sheet, put the letter of the correct answer in the blank to the left of the number of the question.

Multiple Choice Question

____ 1. According to accepted theory, electric current is:
- a. the electron at rest.
- b. the flow of electrons.
- c. the movement of atoms.
- d. the movement of protons.

____ 2. The ohm is the unit of electrical:
- a. current.
- b. voltage.
- c. pressure.
- d. resistance.

Dept.	Prog.	Duty	Task
IN	9273	B	02

PERFORMANCE TEST FOR TASK NO.____

TASK:	Perform Cash Transactions

STUDENT'S NAME ____________________ DATE ____________

DIRECTIONS TO STUDENT: In a store situation, you will set up a till and place the currency in the proper place. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED: For successful attainment ALL items must receive a "YES" Response.	YES	NO	
1.	Were all bills placed in the proper slot?........	...	..	.....
2.	Were all coins placed in the proper compartment?.	...	..	.....
3.	Was the work area cleaned?......................	...	..	.....

_____Score ___Attained
___Not Attained

Dept.	Prog.	Duty	Task	Attempt
DE	4623	C	03	

EVALUATOR'S SIGNATURE

The performance test is always the last page of the learning guide. It may identify checkpoints of evaluation in the performance of skill, or it may list desirable characteristics of the finished product.

**Example of Student Learning Guides taken from : Learning at Ridge Vocational Technical Centers, State of Florida, Department of Education, Division of Vocational Education; June, 1980.

STUDENT ORGANIZATION PARTICIPATION

Vocational student organizations operate pursuant to federal and state laws, which authorize them as viable components of vocational education programs. According to federal regulations, the vocational education program of instruction may include activities of vocational student organizations which are an integral part of the vocational instruction offered and which are supervised by vocational education personnel. The Florida Board of Education Rules authorize vocational student organizations as an integral part of the vocational education program SBER 6A-6.64 (7) and 6A06.65 (8).

Vocational Student Organizations are operated throughout the Nation on the basis of legal endorsement, financial support, and active participation of federal, state and local levels of government as well as the civic and business communities.

Vocational Student Organization Activities are an integral part of the vocational curriculum in Florida. The organizations are designed to expand and enrich opportunities for leadership development, social awareness, civic responsibility, and vocational understanding.

Students who participate in the activities of a vocational student organization are better prepared to take their places in the world of work. They acquire firsthand knowledge of the many opportunities available in their chosen careers, and become aware of the value of their contributions to society.

Vocational student organizations provide opportunities for members to participate in activities which relate to actual or anticipated employment. Students develop and utilize their talents and abilities in ways that otherwise could not be available to them.

Vocational Industrial Clubs of America (VICA)

The Vocational Industrial Clubs of America (VICA) is an organization for students enrolled in trade, industrial, technical, and health occupations in high schools, area vocational-technical centers, and junior and community colleges.

VICA promotes high standards in work ethics, craftmanship, scholarship, and saftey while it fosters a deep respect for the dignity of work. In addition, the precepts of VICA help students relate school experiences to their search for meaning, identity, and achievement. A great deal of emphasis is placed on the functions of labor and management organizations, their interdependence, and their importance.

VICA members learn and develop skills in many different trades, including building, automotive, mechanical, heavy equipment, and electrical. In addition, students in such personal service occupations as cosmetology may be a part of VICA.

Prestige and recognition are offered to the VICA member through a local, regional, state, national, and international program of competition and

awards. Opportunities to develop personal leadership skills are provided through workshops and seminars while competitive activities help to develop the students' perspectives.
Membership in VICA helps students learn to work together and prepare for life through a continuing emphasis on the importance of each person's role as a contributing member of American society.

What is VICA?

VICA is an organization for students enrolled in fulltime secondary or post-secondary trade, industrial, or technical occupations education programs. It is the only national (and international) organization for trade and industrial students.

VICA gives every member a chance to learn, to enjoy the interaction with other students, to assist their schools and communities, and to grow and mature in qualities necessary to meet the challenges of the life ahead of them. VICA members are no different from other students except that they have found a way to make their formal training and education an enjoyable and rewarding experience. They're "turned on" to the satisfaction, rewards, and fun they have found in VICA.

VICA is the students' organization; the goals, purposes, and activities that relate to their own personal career goals and life interests. VICA is for students with a definite future in mind—people who can think with their minds and work with their hands, people who are proud of their work they do and want to learn to do it better. VICA is for those who want to develop as members of society, to learn to express themselves, to work with others, and to make contributions as individuals.

VICA is YOUR organization.

VICA is much more than contests.

VICA is training youth for leadership roles within their schools and communities.

VICA is instilling in youth the importance of participation, within their school, within their community and within the student organization.

VICA is also participation in leadership and skill areas.

A good VICA program gives Industrial Education programs high visibility.

Contests at the local-club level determine which students shall represent their school in regional competitions. Instructors should plan and conduct contests within their trade areas. This philosophy shall also prevail for leadership areas of emphasis. (Successful competitors at local school levels may, in school districts so desiring, compete within the district. THIS IS A SCHOOL DISTRICT OPTION.)

Successful competitors at the local school level compete at one of Florida's five regional contests. Successful competitors next compete at the state level. The state winners compete on the national level, in the United States Skill Olympics.

Competitors for the International Skill Olympics (ISO) are determined by a combination of leadership and skill abilities. The International Skill Olympics Committee establishes all rules and guidelines for the ISO.

The following additional criteria will be used in the selection of International contestants:

a. Overall citizenship—as demonstrated by attitude toward school, occupation, VICA, additional training, etc.
b. Evaluation of progress in skills and knowledge of trade, metric applications, print reading, and layout of problem.
c. Personal desire to represent VICA and the United States in international competition.
d. Willingness to make a commitment to VICA as to purpose of organization, code of conduct, preparation time, etc.
e. Contestant's self-reliance, basic intelligence, ability to follow instruction, maintain schedules, and adapt to last-minute changes.

Local VICA Organization

1. School Club

   Each school is one club (with one charter). A "school" shall be defined as one that appears with an assigned number in the current Florida Directory.

2. Chapters

   In the event that a school has a multiple sessions, each session shall be identified as a "chapter" (example- morning session identified as chapter #1, afternoon session chapter #2, evening session chapter #3, etc.).

3. Section

Each occupational program within each chapter shall be identified as a "section" (example- auto mechanics, welding, cosmetology, etc.).

Organizational Structure

Conducting a local club activity is the responsibility of every member. Every member must have a function to perform. A balanced organizational structure is necessary to equalize the workload as well as to pinpoint responsibility. When the students know what is expected of them, they can better use their abilities to plan and execute their own activities and , at the same time, grow in leadership ability. An effective organizational structure allows for the mixing of people and personalities, which is good human relations training.

It is a good idea to make a poster-size (or larger) organizational chart, to display it on the bulletin board, and to duplicate smaller copies of the chart so each member may have a copy. Members are less likely to shirk their responsibilities when all members are aware of everyone's assigned duties. Advisors must be careful to enforce the chain of command in all decisionmaking situations.

The national organizational structure shows the relationships of the local, state, and national organizations. It is important that every member understand just how the total organization functions. See VICA

Organizational Diagrams at Appendix B.

Intergrating VICA and Instruction

What is meant by the phrase "Integrating VICA and Instruction?" Some teachers feel that integrating VICA activities in between their instructional activities (in printing class, slotting VICA between a unit on the offset press and a unit on stripping) is best. Then there is always the teacher who says,"Look, nothing really happens Friday afternoons anyway, so I will slot VICA activities in on Friday afternoon. We will have our 5-minute VICA club meeting and that will satisfy the talk about integration of VICA activities into the instructional program."

This is not what we are talking about. We are talking about VICA being an integral part of everything that happens inside the classroom.

You may wish to secure and study the slide-tape program "Integrating VICA and Instruction" that is available from your Regional Program Consultant or Regional Program Advisor. You also may wish to purchase the set.

In-school instruction involves the organized presentation and application of knowledge, skills, and attitudes. Laboratory occupational experiences require the individual student to apply, in a simulated work setting, the knowledge, skills, and attitudes acquired through in-school instruction. VICA activities are part of in-school instruction and laboratory occupational experiences. Integrated club activities improve and tie together the existing curriculum.

VICA is specifically for Vocational Instruction Education. The activities of a chapter can be part of the learning experiences planned for any vocational class. Vocational education classes such as welding, foods, drafting, and auto mechanics can utilize VICA as a teaching tool. Any student who is enrolled in Vocational Industrial Education and meets membership requirements can be a member of a VICA club.

Job skills and procedures are often well defined and structured in the vocational programs. For example: in individual vocational courses, such skills as drawing to scale in drafting, tuning a motor in automobile mechanics, and keeping production records in a vocational printing course are taught. Although such skills are often taught at all levels in vocational education, the attitudes and values that promote employability and employment stability often are neglected parts of structured skill-oriented vocational programs. For example: learning experiences dealing with such activities as getting along with coworkers, accepting constructive criticism, or taking orders might not be as easily dealt with or integrated into skill-oriented, vocational courses. (See chart below.)

CLUB ACTIVITIES PROVIDE EXPERIENCE THAT LEAD TO EMPLOYABLE SKILLS AND ATTITUDES

1. Getting along with co-workers.
2. Respecting authority.

3. Accepting criticism.
4. Respecting the rights dignity of others.
5. Meeting deadlines.
6. Working with supervisors.
7. Taking directions.
8. Communicating clearly.
9. Taking initiative.
10. Being punctual.
11. Assuming responsibility.
12. ________________________________
13. ________________________________
14. ________________________________

Being an Effective Advisor

The effective advisor believes in student-directed learning, is organized, and is flexible in planning. The effective advisor works to become a respected person in the community, thereby building support for VICA activities. The effective advisor blends the classroom world with the "working" world and associations, and involves students with business, professional, and community leaders. The effective advisor promotes enthusiasm. For these efforts, the effective advisor receives a lifetime of psychological rewards.

The following club/classroom activities from the teacher/advisor viewpoint, should make being an advisor easier.

1. Advise and guide; do not dictate.
2. Positively assume that club activities are going to succeed. Know that club activities are strong teaching tools. Show enthusiasm.
3. Establish basic ground rules that help students to lead themselves. Hold meetings regularly and conduct meetings in a business-like manner.
4. Organize activities. Set up club files and a library of club-related materials.
5. Remember that club activities are individual and group activities and are NOT teacher activities.
6. Use students as class leaders.
7. Develop professional slide presentations about club work in classes.
8. Develop an informational packet to use with the community and other school personnel. Include such things as curriculum outlines, training plans, national headquarter promotions, calendars of work, etc.

Necessary Groundwork--Selling the VICA CLUB

Selling club activities to the department chairman, school administrators, and the community is an important first step in the organization of a club.

You may be told that there can be no clubs in the classroom and that few students join any more. Keep in mind that the VICA organization is not a club in the traditional sense. With ingenuity, a club can work in any situation in spite of rigid rules. Stress that VICA is INTEGRAL TO THE TOTAL PROGRAM AND SHOULD BE CONSIDERED A VERY IMPORTANT TEACHING TOOL IN AND OUT OF THE CLASSROOM/SHOP. Some suggestions on how to sell club-work are included below.

1. Discuss ideas. Don't spring the idea of an integrated club on people whose support will be needed.
2. Inform people about the state and national organizations by handing out and discussing promotional materials.
3. Make starting a VICA organization part of the agenda of the Craft Advisory Committee's meeting. Present your proposals to this group. Let the committee work with students to plan a program of activities.
4. Survey students on their interests in club activities. Compile and distribute results.
5. Check course outlines to see how club activities can fit in. Add these activities to lesson plans.
6. Relate the school philosophy to the national VICA Organization's goals, purposes, and program of activities.
7. Project the number of resource persons that students would contact in the community who would be up-to-date experts in certain areas.
8. Identify the club as an important public relations tool.
9. Show how club activities are important motivational projects

that promote student-directed learning.

10. If necessary, point out the benefits of club activities in relation to the relatively low cost-per-student.
11. Confer regularly with those in charge, i.e., department chairpersons, officers, and school administrators.

STUDENT ADMISSIONS CRITERIA

INTRODUCTION

Leading the individual student to successful completion of a vocational education program—in either a secondary or a post-secondary institution—should be the only major concern of a school's teaching effort. It is, therefore, of the utmost importance to direct thought, planning, and effort into identifying and selecting students with excellent potential for success in the educational program and in the industry. The school's primary task is to prepare people for full-time, entry-level positions as technicians or, in the case of those with more experience, as managers. Recruiting efforts will, of course, vary from school to school depending upon level (secondary or post-secondary), courses available, and local needs.

Students enrolled in an occupational cluster should be able to benefit from the instructional content therein with reasonable expectations for employment upon successful program completion.

In accordance with the Course Code Directory, an occupational program is offered to students at grade levels specified therein. The specific student admissions criteria required by the state and local education agencies are identified below.

SPECIFIC ADMISSIONS CRITERIA

	SECONDARY	POST-SECONDARY
Minimum age:	n/a	n/a
High School Diploma or GED Required:	no	yes
Physical Requirements:	none	none
Special Requirements:	none	none
* Minimum Basic Skills Math Level:	7.0	7.0
* Minimum Basic Skills Language Level:	7.0	7.0

*This grade level number is specified in the Curriculum Framework and is derived from a state basic skills examination.

In addition, attention should be focused on other personal qualities that, in theory, may be subject to improvement within a training program but, in reality, may prove to be serious impediments to success. Typical would be deficiencies in communications and mathematical skills. Such skills should be measured by tests and the results used as a screening guide or as a basis for providing additional program requirements.

THE STUDENT PROFILE

It is difficult to find an "ideal" student. Many will apply for a place in various training programs. The question is: How can students with the most potential for success be selected?

To attempt to draw a profile of the ideal student candidate would be fruitless because the ideal candidate cannot be defined in a manner that would fit all localities, nor even in such a way as to fit all situations in a single locality. Nevertheless, it is appropriate for the Craft Advisory Committee and the school system to develop a profile as a basic guide, with the certain knowledge that supplying candidates at any given time will necessarily entail compromise.

Rejecting high school students requesting admission to a vocational program would probably not be permitted in any school system in the nation. Even if students could be screened, it would be difficult to determine which would be successful. In a high school program, it may be best to accept as many students as possible and let their abilities surface in the first year or two. It may then be possible to place the strongest students in a vocational "capstone" course in their senior year, either for employment upon graduation or as a necessary prelude to admission to a post-secondary program. Obviously, this is not a perfect solution; but in the real world, perfection is rare.

The community college should make a greater effort to enroll the "ideal" student. This may be done through a process of screening "all comers" or by consciously recruiting potential students with known qualifications. In either case, the school and the Craft Advisory Committee will need to draw a profile of the desirable student. The profile will contain a list of qualities, traits, and aptitudes that combine to make a potentially successful candidate. Since few of these qualities are completely missing in any one person, acceptable levels must also be determined. The qualities deserving of highest attention—mechanical aptitude, for example, or native intelligence—are those which the educational program itself is unlikely to be able to change. Accordingly, such matters should carry considerable weight in establishing the basic profile. Other matters—deficiencies in mathematical or communications skills, for example—may lend themselves to improvement through related instruction, even though they are not parts of the training program per se. Following is a list of specific qualities the Advisory Committee and school staff should consider when establishing the student profile:

MECHANIC/TECHNICIAN—SERVICE

—Knowledge of basic tools and equipment used by mechanics/technicians
—Aptitude needed to think through and solve mechanical and technical problems;
—Ability to understand written mechanical/technical materials;
—Ability to interpret mechanical/technical drawings;
—Mechanical dexterity.

MECHANIC/TECHNICAL SERVICE MANAGEMENT

—Basic knowledge of service;
—Business skills;
—Ability to work with people;
—Communications skills;
—Leadership.

QUALIFYING AND PRETESTING

The process of qualifying a potential student for training must be an integral part of the recruiting process. Considerable amounts of time and money will be spent on students entering training. There must be some assurance that they are receptive to, and capable of benefitting from, the training that will be provided.

In the normal process of recruitment, recruiters will have some idea of the candidate's basic traits and capabilities. Whoever guides the candidate to the program will also have some knowledge of the person's interests, abilities, and experience. These perceptions should be considered by school admissions officials.

Care must be taken, however, to assure that highly favorable early-interview impressions—or negative impressions, for that matter—do not prejudice the final decision. Determination of the candidate's potential for success can be greatly aided by pre-school testing. Such tests can yield reliable clues to certain characteristics, such as mechanical aptitude, that are essential. The tests can also tell a great deal about the candidate's present knowledge and skills. These, in turn, can help determine how much and what kind of training each individual should receive.

Despite the efficacy of many tests, a caveat should be noted. Standardized testing has come under fire, in recent years, from many quarters. It has frequently been charged, for example, that some standardized tests are culturally biased and, consequently, favor one group in society over another. Those charged with responsibility for admissions should be aware that testing, while it can often provide valuable insights, should never be the sole criterion for admissions.

COUNSELING AND GUIDANCE

Counseling is a two-fold activity. Its first use is to guide the qualified, prospective student into the program; its second is to help the enrolled student on a continuing basis throughout the program.

Entry into a program does not cause all student problems to vanish; each student will encounter new problems as the program unfolds. The counselor's job is to work with the student to help identify problems and then work toward their solution. The counselor must also constantly watch for signs of discouragement or loss of interest and attempt to determine their causes.

Much day-to-day counseling will necessarily fall to the teacher. The teacher has the most contact with the student and is often in a position to detect and correct a problem while it is small. Overlap of responsibility between teacher and counselor should be apparent. The importance of working together in this critical area cannot be overstated.

The professional counselor cannot be expected to have the expertise of the teacher. The teacher will therefore provide much of the counseling that focuses on trade knowledge and skills. The counselor, on the other hand, will focus on the student's needs for advice on related instruction and in connection with personal growth, interests, and attitudes. In large programs, at least one counselor with deeper knowledge of the industry should be available.

STUDENT PLACEMENT

Placement will not be a factor with some students, such as those currently employed in the industry. A student from industry, even if in school by personal choice, is likely to have a good idea of where to go when the program is completed. The school placement program should, of course, be as available to these students as to anyone else.

The placement program, for the most part, will serve students who enter with little or no experience in, or contact with, the industry. Many such students will develop industry contacts during the course of instruction, particularly if a cooperative program is offered.

It is logical to center placement activity at the school. The school has an organized placement office for other occupations.

The tasks of the placement official is to fit graduating students to job openings in the community. Identifying graduating students is a simple task, but the placement official will also need to know something of each student's personal aims and interests in addition to what is on the achievement record. The placement official should develop a form that will provide this information in simple format for easy reference. The placement official, the counselor, and the teacher should assist students in the preparation of effective resumes.

Input concerning employment openings is somewhat more difficult to organize. Such input must come from individual service establishments in the community. Each job listing should include as much detail as possible about the work involved. A standard form for this purpose will facilitate matching an applicant to a job.

The placement official should attempt to expose a given student to as many suitable job openings as possible. Conversely, employers should be exposed to as many qualified candidates as possible. The placement official should take special pains to avoid matching up an applicant and a job that are obviously not suited to each other.

The final fit of placing technicians in an appropriate job is the joint responsibility of the student and the employer. The success of this final decision will be greatly enhanced when both student and employer have numerous interview opportunities and as wide an area of choice as possible.

The role of the Craft Advisory committee in placement is two-fold:

—To work closely with the school in establishing an adequate placement function and to evaluate its performance on a continuing basis;

—To work closely with all industry establishments in the community to encourage them to use the school's placement office; to provide adequate job information to the placement office; and to develop an effective procedure for interviewing and evaluating potential employees suggested by the school.

If the need for competent technicians is as great as claimed, and if the educational program performs in such a way as to produce qualified technicians, the failure of local service establishments to follow through with job listings and effective interviewing and hiring practices can seriously impair the ultimate success of the program. It is up to the Advisory Committee to make certain that student placement proceeds in a smooth and effective manner.

TEACHER CERTIFICATION AND QUALIFICATIONS

QUALIFICATIONS

The Teacher is qualified to teach by one of the following methods:

1. Regular or temporary Florida teacher's certificate with appropriate coverage;
2. Approval of local school board consistent with adopted school policy; or
3. Regular or temporary Florida teacher's certificate with other than appropriate coverage; has met all occupational experience requirements prescribed as a prerequisite to appropriate certification, and has been approved by the school board to teach out-of-field.

Refer to the Curriculum Framework for this program to determine the certification coverage for this program.

INSTRUCTIONAL STAFF

It is recommended that the instructional staff have technical competency and meet all state and local requirements for certification.

1. Technical Competency

   Instructor(s) sould have demonstrated technical competency and should hold current, nationally recognized certification in the laboratory areas taught. Instructors should hold current, nationally recognized certification, if awarded.

2. Instructional Certification

   Instructors should meet all state certifying requirements.

3. Technical Updating

   Faculty members should be provided technical materials required to maintain their competency. An opportunity should be provided for instructor(s) to return to industry on a regular basis for in-service and skill upgrading.

4. One or more instructor(s) in each department should hold a current American National Red Cross Standard First Aid Certificate.

5. Substitutes

   A systematic method of obtaining "substitute" or "supply" instructors should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent instuctor in the occupational area and specific competencies taught.

FACILITY DESIGN CRITERIA

INTRODUCTION

Even the best instructor should not be expected to turn out competent and immediately productive graduates if they are forced to learn with out-of-date, improper, or inadequate facilities, tools, and equipment. Planning for and providing the proper facilities, tools, and equipment are difficult parts of establishing a training program, especially when space and budgetary constraints are considered. Facilities, tools, and equipment should be adequate to meet teaching objectives.

This section of the Program Guide contains guidance for setting up classroom activities as well as lab or shop facilities. Diagrams of typical classroom and shop layouts are contained in Appendix A.

REAL-LIFE FACILITIES

The training facility cannot duplicate the real-life facility in which the student will work after graduation. However, the more the school resembles the industrial environment, the easier it will be for the student to make the transition from school to work. Tools, supplies, and test equipment should conform to local industry usage. Although different facilities may utilize different makes of tools and equipment, the actual differences in operation of most equipment are usually not so great. The on-the-job training each graduate will inevitably receive will usually reconcile differences between equipment used in the school and that in the commercial shop.

TEACHING FACILITIES

Additional facilities and equipment will be required that are peculiar to the teaching job itself. Among the more important are:

Classroom space;

Audio-Visual Equipment—motion picture, slide, filmstrip, and overhead projectors; videotape units; microfiche readers;

Special devices to demonstrate basic principles and theory;

Duplication of tools and appropriate equipment to enable several students to work individually on the same service operation;

"Live Work" area(s) or laboratory facilities.

A superior instructor could no doubt make do without much of this equipment. But the availability of state-of-the-art training devices enhances the effectiveness and efficiency of any classroom.

Efficiency means achieving instructional objectives in the shortest time possible. By reducing training time and lost motion, the "return on investment" of the facility increases, competent maintenance persons enter the industry more quickly, and the individual student initiates a career and begins producing personal income sooner.

UPDATING FACILITIES

Facilities and equipment need updating just as curriculum, course content, and instructor capability do—and for the same reasons: technological change and improvements from year to year. Updating facilities and equipment may be more costly than updating course content--but failure to do so, at least minimally, will almost certainly impair the effectiveness of the program in a relatively short time.

DETAILED FACILITIES ANALYSIS

The advisory committee can assist the school in establishing priorities for installing facilities, tools, and equipment. Some are necessary; others are advantageous; and some can be considered nice to have, but essentially unnecessary. Careful planning and analysis of needs over several years can, however, lead to the establishment of a first-rate facility in almost any community.

FACILITIES ORGANIZATION

In planning adequate facilities, one of the more critical considerations—and one that is far too often underestimated—is providing adequate space to meet the changing needs of the instructional program. Buildings should be designed and constructed for future expansion.

WORK STATION ARRANGEMENT

The arrangement of work stations and specialized equipment depends upon the general shape of the facilities, the number of specialized areas depends, to some extent upon the preferences of staff. However, a few fundamentals should be kept in mind:

Convenient location of entrances and exits;

Easy access to and among service benches;

TRAFFIC FLOW

The overall layout of the service facility should be planned so that the location of entrances and exists permits a logical flow of work in progress. The arrangement of benches to obtain an efficient traffic pattern is one of the most critical factors in planning a facility.

PERSONAL TOOL/EQUIPMENT STORAGE AREA

A student tool storage room or area should be provided, with adequate shelf space for tool boxes and floor space for equipment. This area should afford maximum security for student tools.

ADDITIONAL FACILITY CONSIDERATIONS

1. Training Stations

Training stations and live work areas must be available in the type and number required for the performance of the tasks outlined in the program goals and performance objectives.

2. Safety

The facilities must meet all applicable safety standards.

3. Maintenance

A regular facilities maintenance program should be used to assure facilities are suitable when required for instruction.

4. Housekeeping

The classroom, laboratory, and support area(s) should be kept clean and orderly.

5. Office Space

An area separate from the classroom and laboratory should be available and convenient for use by the instructor(s) as an office.

6. Instructional Area

A classroom convenient to, but separate from, the laboratory area should be available for instruction and other non-shop activities.

7. Storage

Storage areas for tools, parts, supplies, and machines must be sufficient to support the activities outlined in the program goals and performance objectives. Security should be provided to prevent pilferage and vandalism.

8. Support Facilities

Restrooms, clean up areas, and lockers should be provided convenient to the instructional area.

9. Ventilation

If required, an adequate fume removal system should be in place and operable. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning.

10. First Aid

A first aid station must be in place, well marked, and complete with appropriate supplies.

11. Facility Evaluation

The advisory committee should be asked to conduct an annual evaluation of the facilities to assure adequacy to meet program needs.

SUGGESTED EQUIPMENT LIST

INDUSTRIAL ELECTRICITY

QUANTITY	ITEM DESCRIPTION
1	Drillpress, 15 in.
1	Arbor Press
1	Rotating Machine lab
1	Industrial Instrumentation & Control System
1	Electrical-Mechanical Trainer
7	Bench, w/stools
1	Electric Motor Control Trainer
1	Electric Wiring Skill Trainer
1	Soldering Equipment
5	Soldering Gun Kit
1	Special Screwdriver Kit
2	Electric Pliers Kit
1	Torch Kit
3	Oscilloscope (Basic)
1	Industrial Electricity Testing Equipment Package
1	Volt-Amp-Wattmeter
1	Industrial Electricity Wood Hand Tools
7	Electricity Concepts Unit
3	Bench-Electricity Pkg. w/stools
1	Electric Drill Set
1	Adjustable Wrench Set
1	Pipe Wrench Set
1	Screwdriver Set (offset)

1	1/4" Drive Socket Set
1	Drill Bit Set
1	Allen Wrench Set (Bracket)
3	Hacksaw, Frame only
1	Screw Extractor Set
3	Vise, Machinists, 5"
1	Riveter, Pop
1	Basic Tool Set
2	Electronic Shop Tool Set
1	Box, Tool, Small
2	Cord, Extension, 25 ft.
1	Screwplate Set, 1/4" - 1/2"
	Analyzer Electric Safety 1020
	Tester Insulation Biddle
	Bender Elec Greenlee 555R W/AS
	Auto Transformer Variac
	Drill Press 15IN Rockwell
	Threader Pipe Geared Rigid
	Bins Revolving 7 Shelfs
	Power Supply Dual Range
	Tester Insulation/Resistant
	Knock Out Punch Set
	Cabinet File 4DR W/Lock
	Saw Band Rockwell 9725
	Vacuum Power Fish Tape Sys Greenlee
	Heater PVC Carlon

VOM Simpson

Industrial Control Trainer Energy

Pipe Threader-Porta Thread-Greenlee

Bench Vise-Wilton

Grinder-Rockwell

Disc Sander 7 Inch Makita

Hand Drill 1/2 Inch Stanley

Trainer Elect/Electr Ces Ed Lab 65

Baldor HD Bench Grinder

Cabinet File 4 DRW

3 x 3 Metal Storage Cabinet

Cabinet Storage 3 x 6 Metal

Hamden Trans Trainer HTTCPIL-1

Hamden DC Controller DCC100

Hamden AC Wattmeter HMD 100

Hamden Mobile AC Motor Controller

Air Controller ACC 100

Hamden Mobile DC Motor Control 423D

Precision Oscilloscope

Trainer Residential Electricity

Hamden DC Automatic Starter DCAS10

Resistance Load Hamden RL100A

Speed Control Rectifier Hamden

Synchronous Machine Hamden SM-100

Wound Rotor Motor WRM 100 Hamden

DC Automatic Starter CDMF Hamden

Dynamometer DYM100DM Hamden

Wheatstone Bridge SWB1 Hamden

Resistance/Reactance Load Hamden

Wound Motor Speed Controller Hamden

DC Machine DM100 Hamden

Multi Function Machine MEM100-1

AC Wattmeter ACWM100-1 Hamden

Pony Brake PB100 Hamden

Induction Motor 1M100 Hamden

Capacitor Start Motor Hamden

Split Phase Motor SPM100 Hamden

3 Phase AC MAG Starter MS100-3A HA

Elec Panel Clock Sys HMPC2 Hamden

Ground Fault Protection Demonstrator

Emergency Lighting Demo Board HAMDEN

3-4 Point DC Starter Hamden DCMS10

Fluid Power Training Sys Hamden

Electronic Appliance Meter Lab Vol

Basic Electric Trainer AA341

Solid State Elec Motor Demonstrator

Automatic Circuit Breaker Demo Board

Automatic Transfer Switch 940

Automatic Starting Switch

Dissectable Trans Kit Hamden 1290

Resistive Load Unit Digiac 626-10

Electromechanical Solenoid Trainer

Photo Electrical Control Digiac

Industrial Control Trainer 3Phase

Industrial Control Trainer Single Phase

Rigid Bender 300

Portable Hydra Bender Greenlee 777

Hydraulic Power Pump Greenlee

Oscilloscope Leader 32

Base Unit Motor Gen EC613-01

Sequence Controler EC644-40

Wound Motor Speed Control EC13-54

Power Supply Electrolab EC10535

Pipe Vise Tristand

Electric Typewriter

Time Clock 3051 Cincinnati

Transformer Trainer Consul-Lab CL3

Residential Electrial Trainer BRD

Controller CRT Sy/Max-20 Square D

SAFETY

The Florida State Board of Education establishes rules for the operation of public schools. Part III, Section B, Chapter 6A-2 of the State Board of Education Rules contains the standards for existing educational facilities. Subsections deal with the entire school facility in regard to such topics as electrical equipment, flammable materials, ventilation, fire safety, storage, and illumination.

Specifically, subsection 6A-2.97, which follows, contains regulations unique to Vocational classes.

S.B.E. Rule 6A-2.97: Safety devices in shops, laboratories, and other process areas

(1) Use of personal protection devices and other protective equipment is required when students and staff are exposed to the following:

(a) Arc welding, heavy gas cutting, scarfing
(b) Spot welding, brazing, or cutting
(c) Machining of any materials causing flying chips
(d) Injurious radiations, dusts, fumes, gases, vapor mists
(e) Sledging, hammering, chipping, scaling, drilling, grinding, chiseling, wire brushing, and caulking operations where flying objects or particles may strike the body
(f) Chemicals, acids, caustics, and molten metals

(2) Personal protection devices which come in contact with the skin shall be sanitized after each use.

(3) Clothing, jewelry, and personal grooming of personnel in shops and labs shall not constitute a hazard.

(4) Individual equipment power shut-off, within reach of the operator, shall be provided for all working machinery. Each individual machine shall be equipped with an approved electromagnetic starter switch.

(5) No safeguard, safety appliance, or safety device guarding a machine or machine part shall be removed or made ineffective except when the machine is stopped and for the purpose of immediate cleaning, repairing, or adjusting. Upon completion of repairing, cleaning, or adjusting, such guard, appliance, or device shall immediately be replaced. Any shop or laboratory tool or equipment found to be unsafe shall be red-tagged and removed from service until the condition is corrected.

(6) The floors in areas where machines are used shall be kept free from waste, grease, and obstructions.

(7) Welding operations shall be located in a shielded area, and

the area shall be free of combustible material and persons not wearing protective devices.

(8) Areas where toxic fumes are produced shall be properly vented to the outside.

(9) Flammable fumes or dust produced in a student-occupied facility shall be mechanically exhausted to the outside with approved explosion-proof motor-driven equipment with filters in place.

(10) Each space equipped with unprotected gas valves accessible to students shall have an approved master cut-off readily accessible to the instructor.

(11) Each shop or lab equipped with electrically powered machinery accessible to students shall have one or more conspicuously color-coded disconnect switches at convenient locations throughout the space.

(12) Kilns shall be properly shielded from combustibles, combustible surfaces, and personnel, and shall not be located in the path of or adjacent to any means of egress, or exposed to unauthorized persons.

(13) Automotive, body, and frame repair areas requiring welding and cutting shall be separated from engine overhaul and

related fuel handling activities.

(14) A tire cage shall be provided when pressurizing tires on split rims.

(15) Vehicle lifts shall be provided with a mechanical safety lock.

(16) Piping and working machinery with component parts shall be safety color-coded in accordance with ANSI Z53.1-1971.

(17) The safety color-coded chart shall be posted in a conspicuous place available to employees and students.

(18) Hazardous work and storage areas shall be identified by appropriate caution signs.

(19) All equipment designed to be permanently mounted shall be securely fastened to its supporting surface.

(20) Safety zone lines shall be used on the floor area surrounding working machinery.

(21) Fume hoods shall be provided and kept in proper operating condition. Operations where flammable gas, toxic vapors, or noxious odors are given off shall be performed in the

fume hoods.

(22) Safety equipment such as showers and floor drains, eye wash, fire blankets, and proper extinguishing equipment shall be provided, properly installed, and maintained correctly.

INSTRUCTOR RESOURCES

INDUSTRIAL ELECTRICITY
AND
COMMERCIAL AND INDUSTRIAL ELECTRICITY

LEARNING RESOURCES

Support material consistent with both program goals and performance objectives should be available to staff and students.

1. Service Manuals

   Manuals with current manufacturer's service procedures and specifications. These manuals must be located where students can use them while working in the shop area.

2. Multi-Media

   Appropriate up-to-date multi-media materials such as flip charts, tape slides, motion pictures, overhead transparencies and video projection media should be decentralized, readily available wherever possible, and utilized in the training process.

3. Instructional Development Services

   The services of professional instructional development personnel should be used when available. At a minimum, equipment and supplies should be available for duplication of printed material and overhead projector transparency development. Instructional development personnel should conduct in-service workshops and/or other training in curriculum and media development on a structured basis.

4. Periodicals

Current general and technical magazines and newspapers should be available for student and instructor use.

5. Student Materials

Necessary instructional texts or pertinent material should be available for each student to satisfy the objectives of the mode of instruction used. Where textbooks are used, specialized texts should carry a copyright date no older than 3 years, basic texts no older than 6 years.

PRINTED AND AUDIOVISUAL MATERIALS

This list contains an extensive number of organizations providing training materials. Some materials are free; for others, there is a charge. Details should be requested in writing prior to ordering.

TEXTBOOKS

1. National Electric Code Handbook; NFPA.

2. Electric Wiring - Residential; Delmar.

3. Electric Wiring - Commercial; Delmar.

4. Electric Wiring - Industrial; Delmar.

5. Designing Electrical Systems; American Technical Publishing (ATP).

6. Benefield Conduit Bending Manual.

7. Motor Control Fundamentals and Workbook; Rockis and Mazur; American Technical Publishing (ATP).

8. Electricity One Seven; Hayden Book Company.

9. Industrial Motor Control; Delmar.

10. Industrial Electricity; Delmar.

11. Electricians Handbook.

12. Industrial Electricity & Electrical Wiring Bibliography. Florida State Department of Education, Vocational Division. #IE112.

13. Academically Disadvantaged Electrical Wiring Materials. Florida State Department of Education, Vocational Division. #IEB13.

14. Maintaining the Lighting and Wiring System. Florida State Department of Education, Vocational Division. #IE122.

15. Understanding Electricity and Electrical Terms. Florida State Department of Education, Vocational Division. #IE125.

16. Introduction to Industrial Electricity Electronics. Florida State Department of Education, Vocational Division. #IE161.

17. Florida State Department of Education, Vocational Division. Teaching Academically Disadvantaged Students in Vocational Education Courses, #DD012 BK-82.

18. Florida State Department of Education, Vocational Division. Keys to Managing Competency-Based Instruction, #TE036 BK-77.

19. Florida State Department of Education, Vocational Division. Guidelines For The Review and Selection of Instructional Materials for Competency-Based Education, #TE034 BK-80.

20. Florida State Department of Education, Vocational Division. Employability Skills Series, #CE001 SS-81. (CE003, CE004, CE009, CE010, CE017, CE018, CE024, CE025, CE029, CE030, CE037, CE038)

AUDIO-VISUAL

1. Basic Electricity; (slide) Honeywell.

2. Meter Reading 1 & 2; (filmstrip) EDI.

3. Bulbs, Batteries, Buzzers 1 & 2; (filmstrip) EDI.

4. Meter is the Measure of the Man; (filmstrip) A.W. Sperry.

5. Introduction to Electricity; (slides & workbook) Lab Volt.

6. Components, Symbols, Schematics; (slides & workbook) Lab Volt.

7. Voltage, Current, Resistance; (slides & workbook) Lab Volt.

8. Ohms Law; (slides & workbook) Lab Volt.

9. Volts, Amps, Ohms, Inductance Part I & II; (slides & workbook) Industrial Media - Practical Electricity.

10. Electromechanical & Mechanical; (slides & workbook) Industrial Media - Practical Electricity.

11. Schematic Symbols; (slides & workbook) Industrial Media - Practical Electricity.

12. Electricity to Go; (filmstrip) Duracell Batteries.

13. Magic of Batteries Revealed; (filmstrip) Duracell Batteries.

14. Understanding Basic Principles of Electric Motors; AAUIM.

15. Types of Motors and How They Run; AAUIM.

16. Electrical, Planning, & System Components #11; (filmstrip) Mechanical & Electrical Systems.

17. Electrical, Materials, & Installation #12; (filmstrip) Mechanical & Electrical Systems.

18. Careers in Electricity 105; (filmstrip) Library Filmstrip Center (LFC).

19. Electrical Safety in the Shop 101; (filmstrip) Library Filmstrip Center (LFC).

20. Electronic Multimeters - Functions & Use; (filmstrip) Library Filmstrip Center (LFC).

21. Electronics - Schematics Symbols; (filmstrip) Library Filmstrip Center (LFC).

22. Series on Safety (1-10); OSHA.

23. SL-1 Branch Circuit & Feeder Calculations; (slides & workbook) NFPA.

24. SL-2 Overcurrent Protection; (slides & workbook) NFPA.

25. SL-3 Grounding; (slides & workbook) NFPA.

26. SL-4 Hazardous Locations; (slides & workbook) NFPA.

27. Magnetic Motor Controls; (filmstrip & workbook) McGraw-Hill Electra Ed.

28. Motor Control Circuits NEC 430; (filmstrip & workbook) McGraw-Hill Electra Ed.

29. Electricity—Just a Click Away; Florida Power Corporation.

30. Waste Watchers; Florida Power Corporation.

31. Safe Use of Electricity; Florida Power Corporation.

32. Introduction to Electricity; (VHS tape) State of Florida.

33. Voltage, Current, & Resistance; (VHS tape) State of Florida.

34. Scientific Notation & Metric Prefixes; (VHS tape) State of Florida.

35. Ohms Lay & Power; (VHS tape) State of Florida.

36. Series Circuits; (VHS tape) State of Florida.

37. Introduction to Parallel Circuits; (VHS tape) State of Florida.

38. Parallel Circuit Analysis; (VHS tape) State of Florida.

39. Parallel-Series Circuits; (VHS tape) State of Florida.

40. Series-Parallel Circuits; (VHS tape) State of Florida.

41. Voltage Dividers & Power (165'); (VHS tape) State of Florida.

42. An Introduction to Kirchoff's Law; (VHS tape) State of Florida.

43. Advanced Methods of DC Circuit Analysis; (VHS tape) State of Florida.

44. Capacitors & the RC Time Constant; (VHS tape) State of Florida.

45. Inductors & the 4R Time Constant; (VHS tape) State of Florida.

46. The Ohmmeter & Its Use; (VHS tape) State of Florida.

47. Interpreting the Resistor Color Code; (VHS tape) State of Florida.

48. The Voltmeter & Its Use; (VHS tape) State of Florida.

49. The Ammeter & Its Use; (VHS tape) State of Florida.

50. Ohms Law & Series Circuits; (VHS tape) State of Florida.

51. Parallel Resistances; (VHS tape) State of Florida.

52. Parallel Circuits; (VHS tape) State of Florida.

53. The Mechanical Switch; (VHS tape) State of Florida.

54. Series Parallel Circuits; (VHS tape) State of Florida.

55. Voltage Dividers/Parallel Branch Circuits; (VHS tape) State of Florida.

56. Network Analysis With Multiple Voltage Sources; (VHS tape) State of Florida.

57. The Weatstone Bridge; (VHS tape) State of Florida.

58. RC Time Constants; (VHS tape) State of Florida.

59. Inductance & the 4R Time Constants; (VHS tape) State of Florida.

60. Water Heaters - (in shop); (VHS tape) State of Florida.

61. The Electron Theory, 801-1; (filmstrip) Bergwall.

62. Circuits, Symbols, Diagrams , 801-2; (filmstrip) Bergwall.

63. Meter Reading & Ohms Law, 801-3; (filmstrip) Bergwall.

64. Series Circuits, 801-4; (filmstrip) Bergwall.

65. Parallel Circuits, 801-5; (filmstrip) Bergwall.

66. Resistor & Complex Circuits, 801-6; (filmstrip) Bergwall.

67. AC: What Is It & Where Used, 802-1; (filmstrip) Bergwall.

68. AC: Voltage & Power, 802-2; (filmstrip) Bergwall.

69. Oscilloscopes: How to Use Them, 802-3; (filmstrip) Bergwall.

70. Oscilloscopes: Measuring Voltage, 802-4; (filmstrip) Bergwall.

71. Oscilloscopes: Frequency, 802-5; (filmstrip) Bergwall.

72. Magnetism & Electromagnetism, 802-6; (filmstrip) Bergwall.

73. Inductors & Reactance, 802-7; (filmstrip) Bergwall.

74. Transformers, 802-8; (filmstrip) Bergwall.

75. Capacitors & Reactance, 802-9; (filmstrip) Bergwall.

76. RCL In AC Circuits, 802-10; (filmstrip) Bergwall.

77. NEC Requirements, 803-1; (filmstrip) Bergwall.

78. Electrical Wiring Techniques, 803-2; (filmstrip) Bergwall.

79. Receptacles & GFI, 803-3; (filmstrip) Bergwall.

80. Switch Control, 803-4; (filmstrip) Bergwall.

81. 3W & 4W Switches, 803-5; (filmstrip) Bergwall.

82. Fuse & Circuit Breaker Panels, 803-6; (filmstrip) Bergwall.

83. Estimating the Job, 804-1; (filmstrip) Bergwall.

84. Planning the Job, 804-2; (filmstrip) Bergwall.

85. Underground Service Entrance, 804-3; (filmstrip) Bergwall.

86. Roughing In the Wiring, 804-4; (filmstrip) Bergwall.

87. Installing Recessed Fixtures, 804-5; (filmstrip) Bergwall.

88. Installing Bathroom Light & Fan, 804-6; (filmstrip) Bergwall.

89. Special Purpose Outlets, 804-7; (filmstrip) Bergwall.

90. Small Appliance Outlets, 804-8; (filmstrip) Bergwall.

91. Oil Burner-Forced Hot Air, 804-9; (filmstrip) Bergwall.

92. Hanging the Fixtures & Receptacles, 804-10; (filmstrip) Bergwall.

93. Installing Signal Systems, 804-11; (filmstrip) Bergwall.

94. Installing Telephones, T.V., 804-12; (filmstrip) Bergwall.

95. Smoke & Fire Detectors, 804-13; (filmstrip) Bergwall.

96. Workshop Lighting & Receptacles, 804-14; (filmstrip) Bergwall.

97. Outdoor Lighting 1, 804-15; (filmstrip) Bergwall.

98. Outdoor Lighting 2, 804-16; (filmstrip) Bergwall.

99. Vectors & Vector Analysis, 805-1; (filmstrip) Bergwall.

100. Rotating Vectors, 805-2; (filmstrip) Bergwall.

101. Series LC Circuits, 805-3; (filmstrip) Bergwall.

102. Series LCR Circuits, 805-4; (filmstrip) Bergwall.

103. Parallel LC & LCR Circuits, 805-5; (filmstrip) Bergwall.

104. Series Resonance, 805-6; (filmstrip) Bergwall.

105. Parallel Resonance, 805-7; (filmstrip) Bergwall.

106. Principles of Operation 1 (Rotating Machinery Explained), 810-1; (filmstrip) Bergwall.

107. Principles of Operation 2 (Rotating Machinery Explained), 810-2; (filmstrip) Bergwall.

108. Identify the Armature & Fields, 810-3; (filmstrip) Bergwall.

109. Measuring Motor Resistance : Voltmeter-Ammeter Method, 810-4; (filmstrip) Bergwall.

110. Counter Electromotive Force, 810-5; (filmstrip) Bergwall.

111. Squirrel-cage Induction Motor 1, 813-1; (filmstrip) Bergwall.

112. Squirrel-cage Induction Motor 2, 813-2; (filmstrip) Bergwall.

113. Across the Line Starter, 813-3; (filmstrip) Bergwall.

114. Reversing Magnetic Starters, 813-4; (filmstrip) Bergwall.

115. Checking Capacitors, AC-8; (slides) State of Florida.

116. Motor Maintenance, AC-9; (slides) State of Florida.

117. Checking Electricity, AC-12; (slides) State of Florida.

118. Working With Electrical Componencs—Symbols & Diagrams, AC-13; (slides) State of Florida.

119. Measuring Resistance, AC-14; (slides) State of Florida.

120. Measuring Voltage, AC-15; (slides) State of Florida.

121. Measuring Current, AC-16; (slides) State of Florida.

122. Applying Basic Electrical Theory, AC-17; (slides) State of Florida.

123. Working with Series Circuits, AC-18; (slides) State of Florida.

124. Working with Parallel Circuits, AC-19; (slides) State of Florida.

125. Working with Combination Circuits, AC-20; (slides) State of Florida.

126. Checking for Magnetism & Electromagnetism, AC-21; (slides) State of Florida.

127. Working with Relays & Solenoids, AC-22; (slides) State of Florida.

128. Checking Characteristics of AC Current, AC-23; (slides) State of Florida.

129. Working With Transformers, AC-24; (slides) State of Florida.

130. Working with 1 0 AC Induction Motors, AC-25; (slides) State of Florida.

131. Working with 3 0 AC Induction Motors, AC-26; (slides) State of Florida.

132. Checking Electrical Wiring, AC-27; (slides) State of Florida.

133. Servicing Electronic Controls, AC-28; (slides) State of Florida.

134. Procedure for Checking and Replacing Current Relays, AC-35; (slides) State of Florida.

135. Checking Step-down Transformers, AC-71; (slides) State of Florida.

136. Servicing Electronic Controls, AC-74; (slides) State of Florida.

137. Replacing Solid-State Controls, AC-75; (slides) State of Florida.

138. Troubleshooting Magnetic Starters, AC-76; (slides) State of Florida.

139. Procedure for Checking & Replacing Potential Motor-Starting Relays, AC-79; (slides) State of Florida.

140. Working With Solid-State Devices, AC-117; (slides) State of Florida.

150. Wire Sizes & Voltage Drop; (16mm movie) U.S. Government.

151. Three Wire Service; (16mm movie) U.S. Government.

152. Roughing Non-Metalic Sheath Cable; (16mm movie) U.S. Government.

153. Installing Surface Metal Raceway; (16mm movie) U.S. Government.

154. Preparing Old Building For Wiring; (16mm movie) U.S. Government.

155. Electrical Circuit Faults; (16mm movie) U.S. Government.

156. Installing Conduit; (16mm movie) U.S. Government.

157. Power Bending Conduit; (16mm movie) U.S. Government.

158. Cable Surface Wiring; (16mm movie) U.S. Government.

PROFESSIONAL ORGANIZATIONS AND SUPPORT SERVICES

PROFESSIONAL ORGANIZATIONS

Membership in professional associations offers vocational educators an enormous range of opportunities for working together to strengthen the field and to develop personal competence and satisfaction in work. The associations have similar goals and activities. They seek excellence in program content by means of joint efforts among members, communications that keep members current, forums for the discussion of issues in the field, useful and stimulating publications and sound professional growth experiences at local, state, regional, and national meetings and annual conventions. They are concerned with increasing public understanding and support of the field.

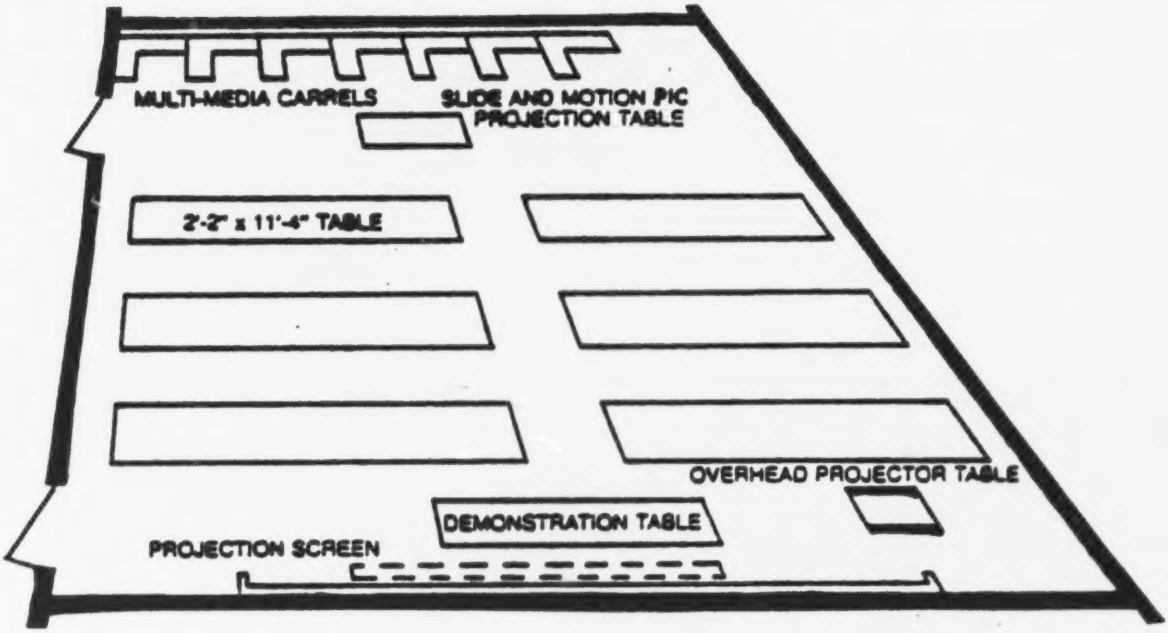
VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)
ELECTRICAL WORKERS ASSOCIATION (EWA)
INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS (IBEW)
ASSOCIATED BUILDERS AND CONTRACTORS (ABC)
JOURNEYMANS LICENSE - each county

APPENDIX A

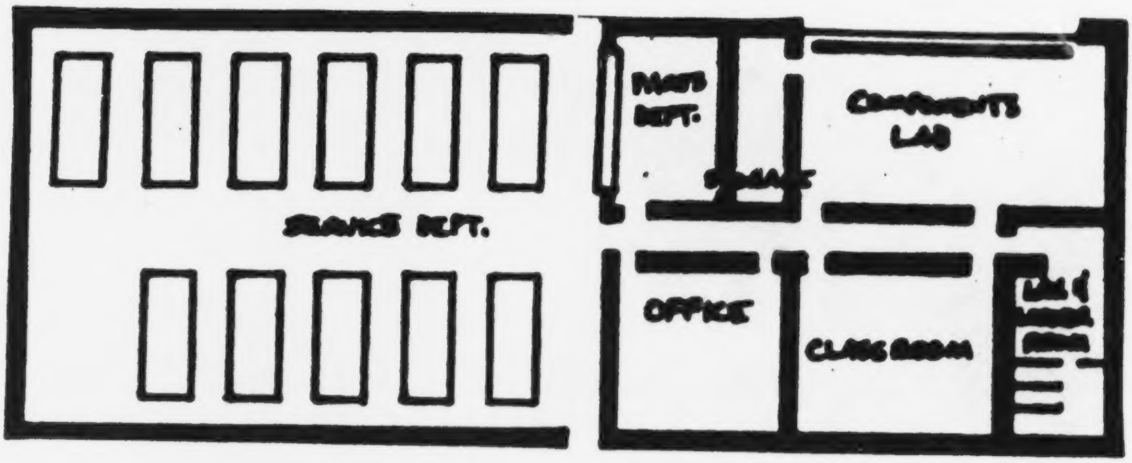
FACILITIES DIAGRAMS

A-1

SUGGESTED LAYOUT FOR A CLASSROOM

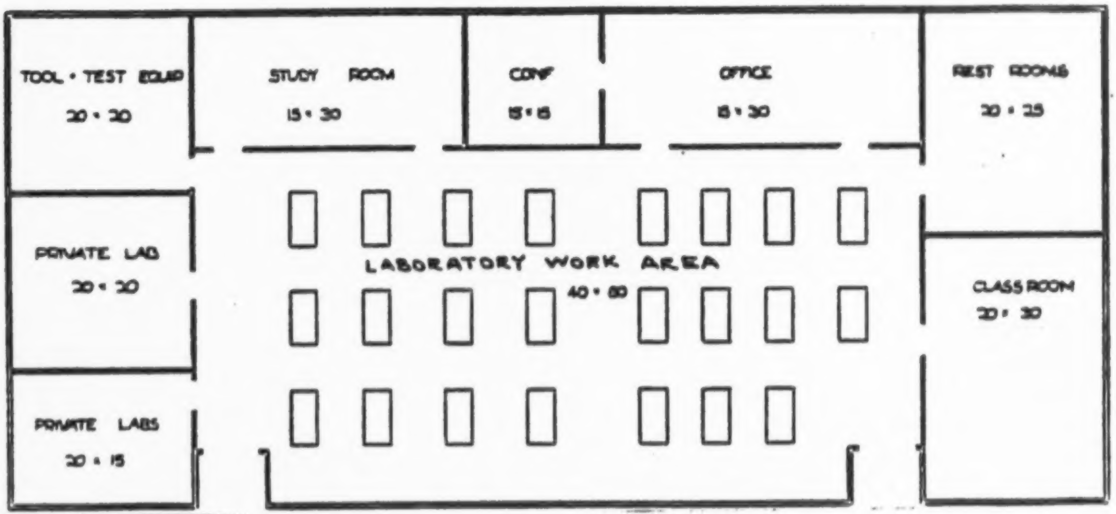

MULTI-MEDIA CARRELS
SLIDE AND MOTION PIC PROJECTION TABLE
2'-2" x 11'-4" TABLE
OVERHEAD PROJECTOR TABLE
DEMONSTRATION TABLE
PROJECTION SCREEN

TYPICAL LABORATORY OR CLINICAL SETTING


SERVICE DEPT.
PARTS DEPT.
STORAGE
COMPONENTS LAB
OFFICE
CLASSROOM

A-3

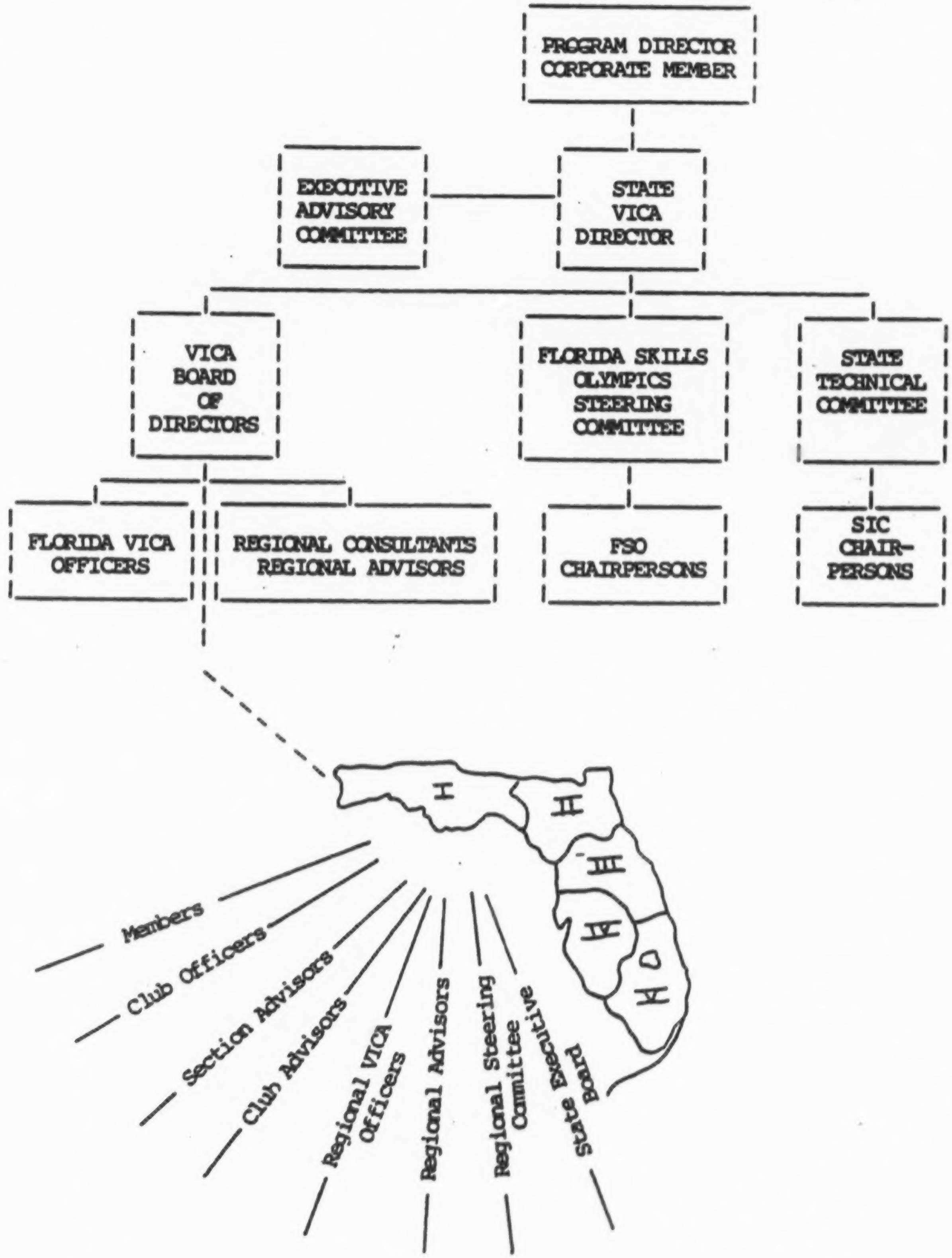
TYPICAL COMBINATION OF CLASS/LAB AREAS

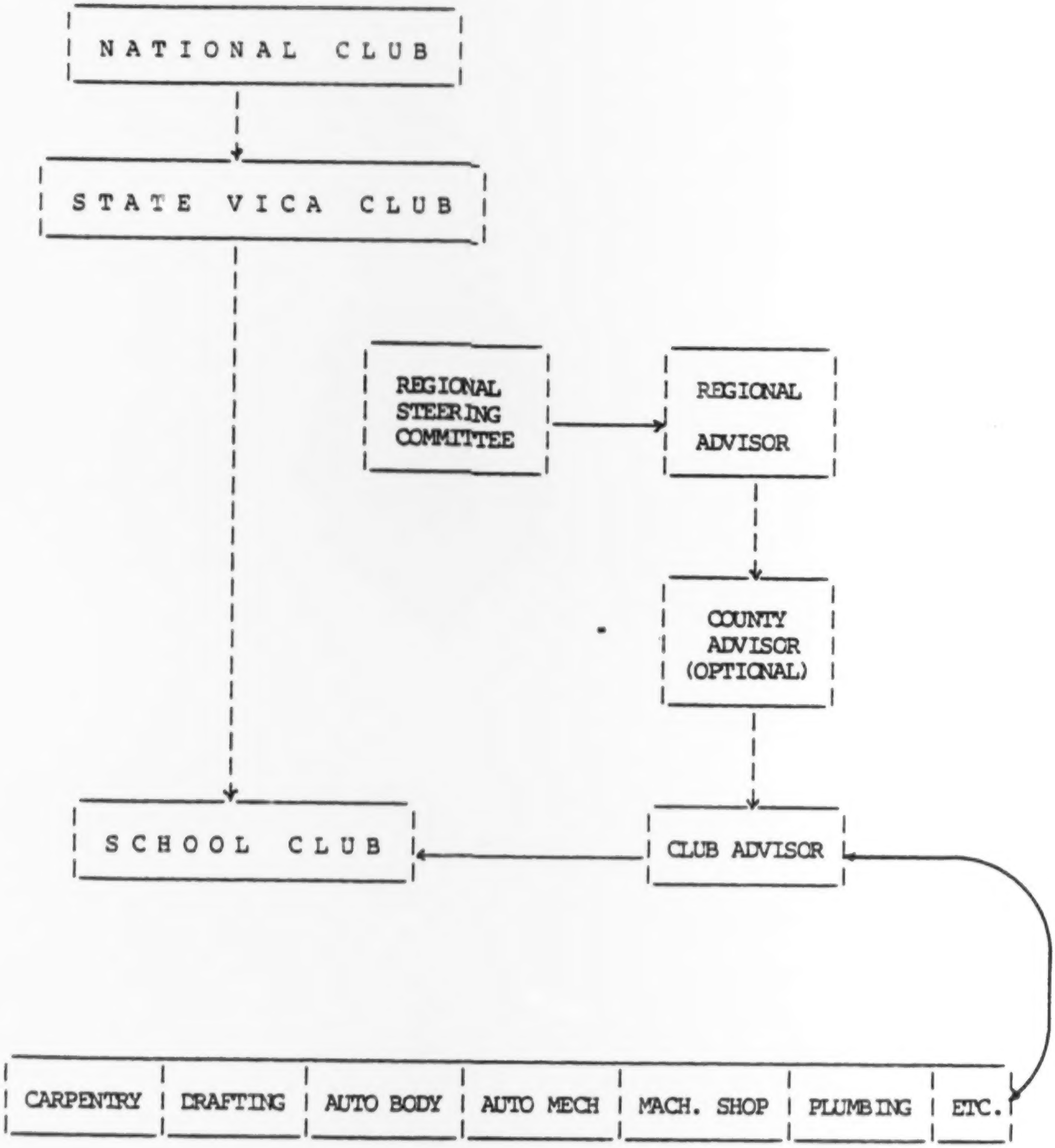

TOOL • TEST EQUIP
20 x 20
STUDY ROOM
15 x 30
CONF
15 x 15
OFFICE
15 x 30
REST ROOMS
20 x 25
PRIVATE LAB
20 x 20
LABORATORY WORK AREA
40 x 80
CLASS ROOM
20 x 30
PRIVATE LABS
20 x 15

APPENDIX B

VICA ORGANIZATION CHART

B-1


PROGRAM DIRECTOR
CORPORATE MEMBER
EXECUTIVE ADVISORY COMMITTEE
STATE VICA DIRECTOR
VICA BOARD OF DIRECTORS
FLORIDA SKILLS OLYMPICS STEERING COMMITTEE
STATE TECHNICAL COMMITTEE
FLORIDA VICA OFFICERS
REGIONAL CONSULTANTS
REGIONAL ADVISORS
FSO CHAIRPERSONS
SIC CHAIR-PERSONS
I
II
III
IV
V
Members
Club Officers
Section Advisors
Club Advisors
Regional VICA Officers
Regional Advisors
Regional Steering Committee
Executive State Board


NATIONAL CLUB
STATE VICA CLUB
REGIONAL STEERING COMMITTEE
REGIONAL ADVISOR
COUNTY ADVISOR (OPTIONAL)
SCHOOL CLUB
CLUB ADVISOR
CARPENTRY
DRAFTING
AUTO BODY
AUTO MECH
MACH. SHOP
PLUMBING
ETC.